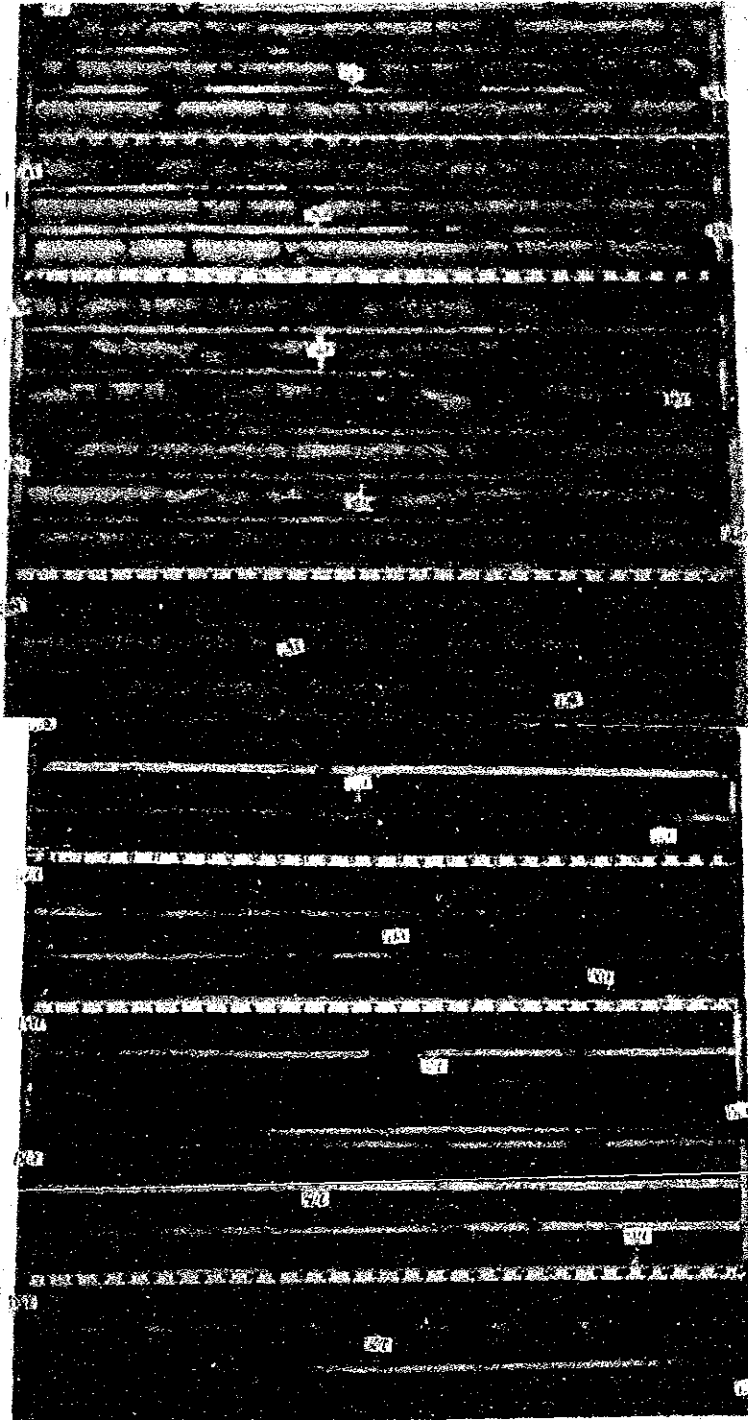
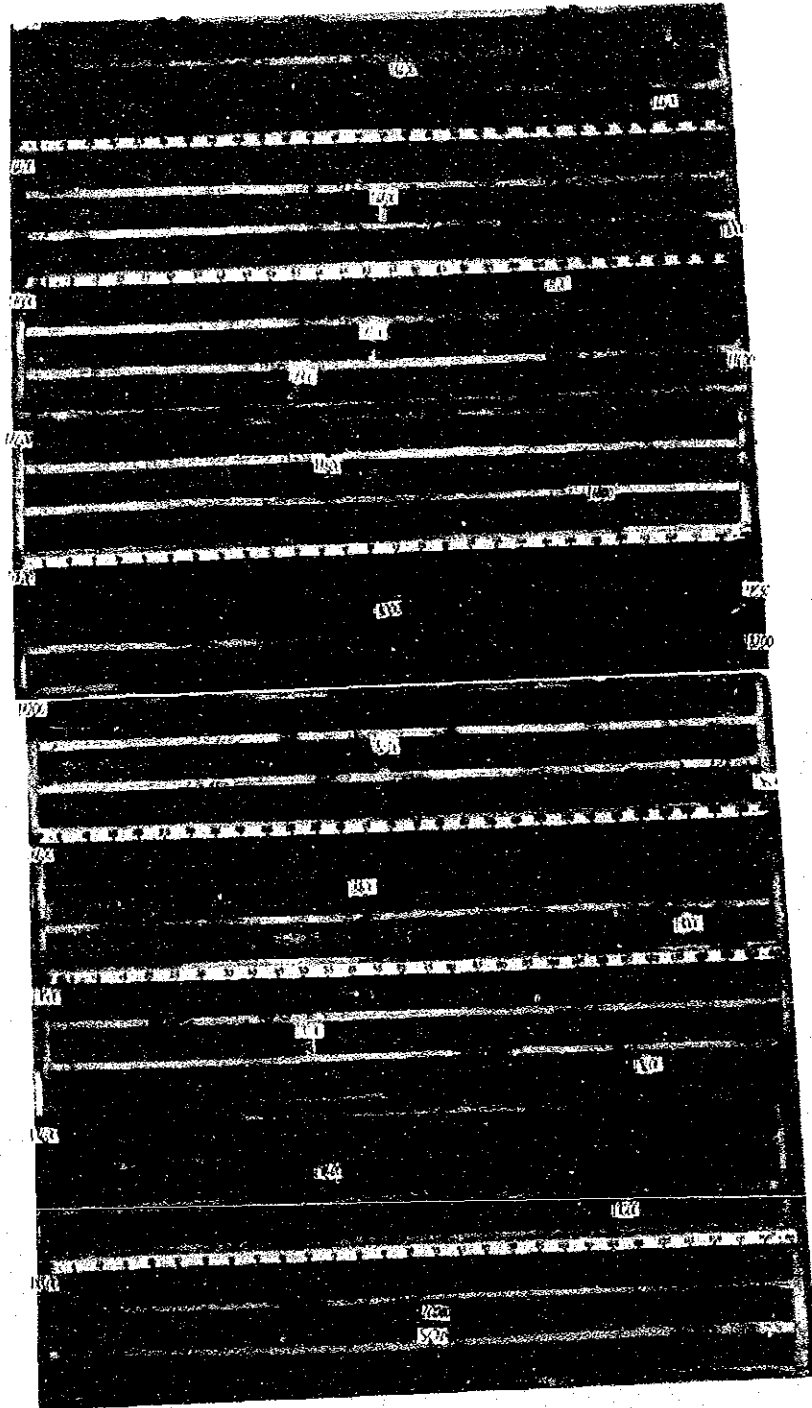


SG-102 ( 122 m ~162 m )



AP-3-136

SG-102 ( 162 ~ 200 m )

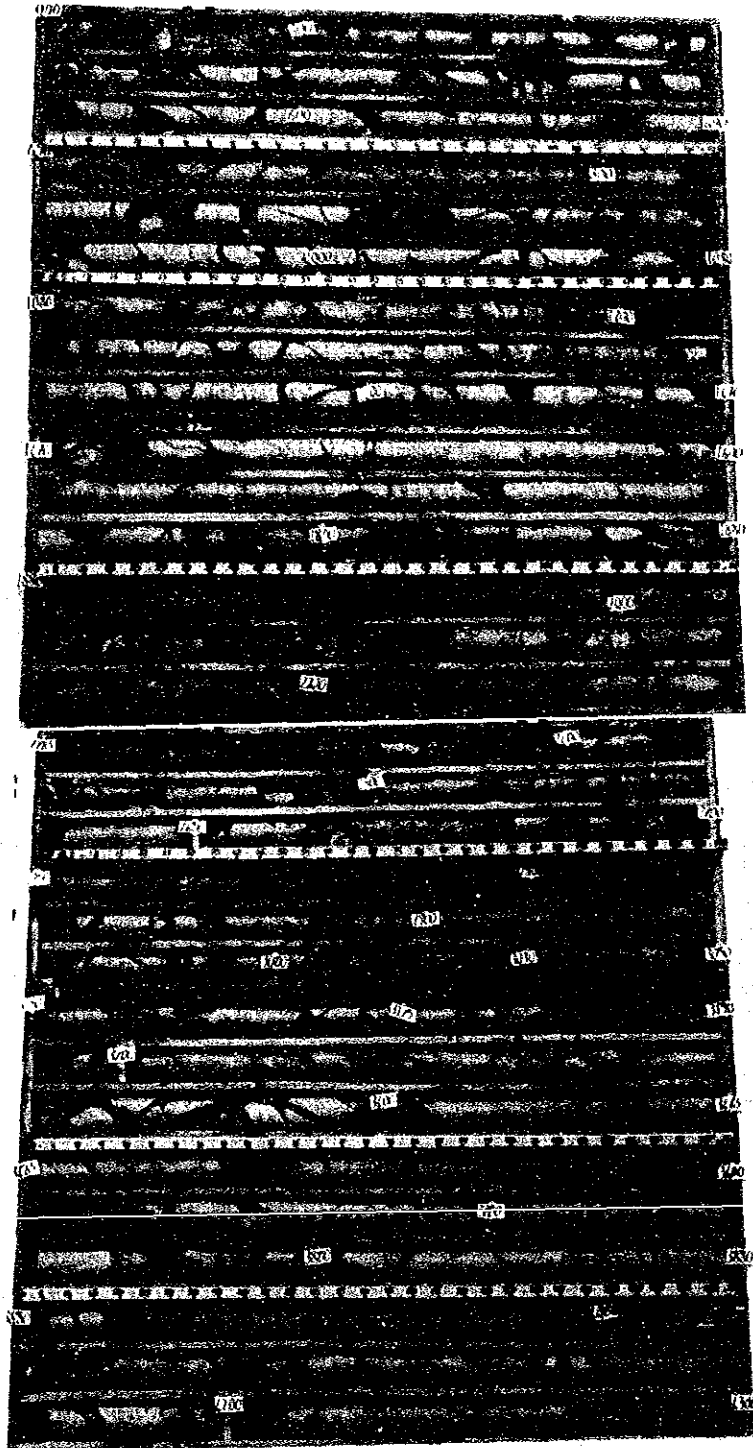


AP-3-137

SGE-106 (L= 125 m, EL. 868.2 m)

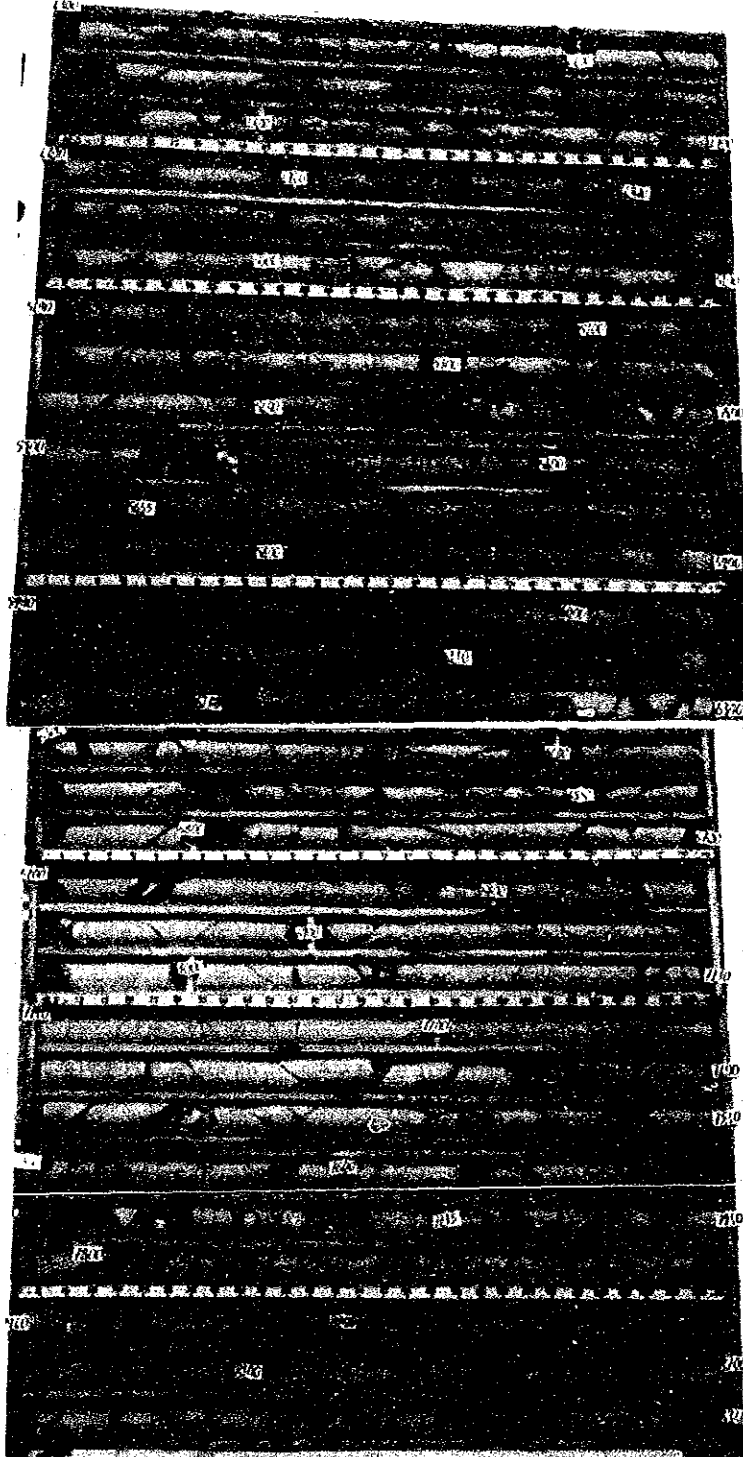
Ayvali Damsite, right bank

SGE-106 ( 0 ~ 43 m )

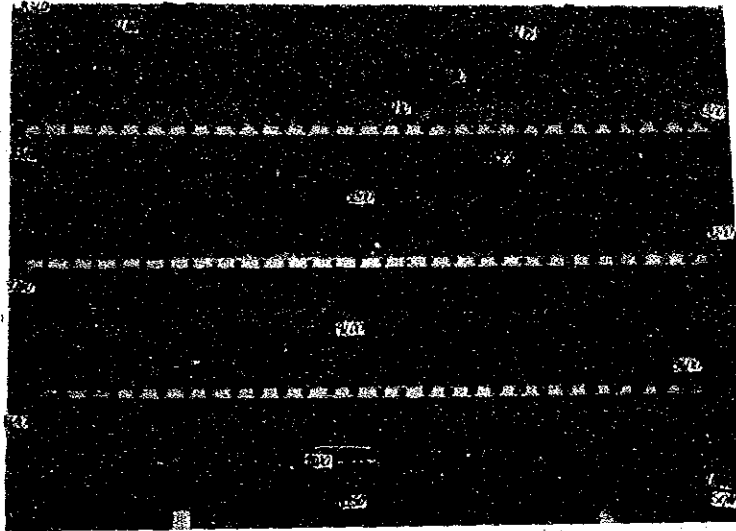


AP-3-138

SGE-106 ( 43 ~ 83.4 m )



SGE-106 ( 83.4 ~ 100 m )



AP-3-140

Micrograph and Petrographic Description of Rock ( 1-3 )

Locality:

Olur Damsite, Right bank  
Drill Hole SK-211,  
Depth 62.9 m

Rock Name:

Granite porphyry



0 0.5 1mm

( Crossed nicols )

Petrographic Description:

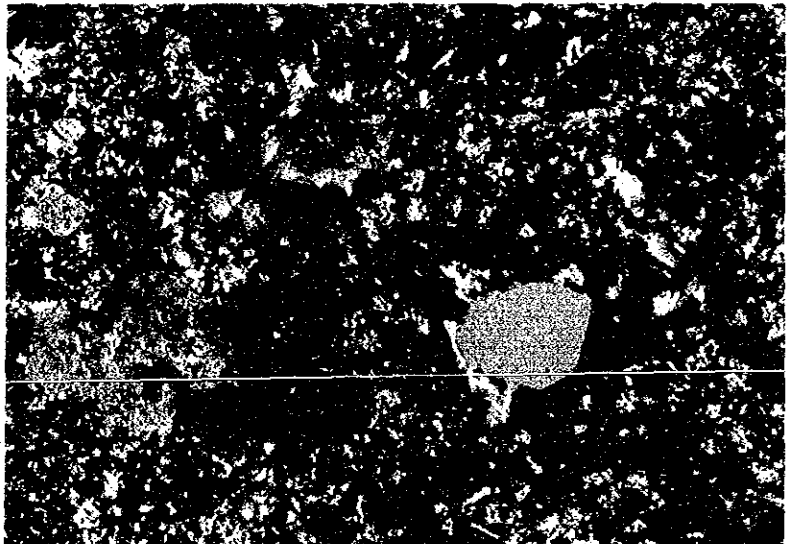
Chief consisting minerals are plagioclase, quartz and potassium feldspar.  
Holocrystalline—porphyritic texture.

Locality:

Olur Damsite, Left bank  
Drill Hole SK-212,  
Depth 21.5 m

Rock Name:

Rhyolite



0 0.5 1mm

( Crossed nicols )

Petrographic Description:

Chief consisting minerals are plagioclase, potassium feldspar and quartz.  
Small amount of cericite are observed.  
Spherulitic texture and Porphyritic texture.

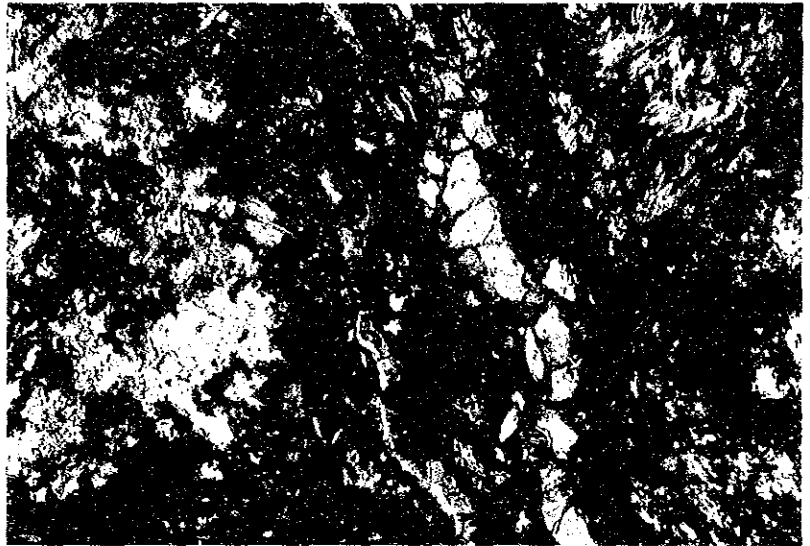
Micrograph and Petrographic Description of Rock ( 2-3 )

Locality:

Olur Damsite, Left bank  
Drill Hole SK-212,  
Depth 72.0 m

Rock Name:

Diabase



0 0.5 1mm ( Crossed nicols )

Petrographic Description:

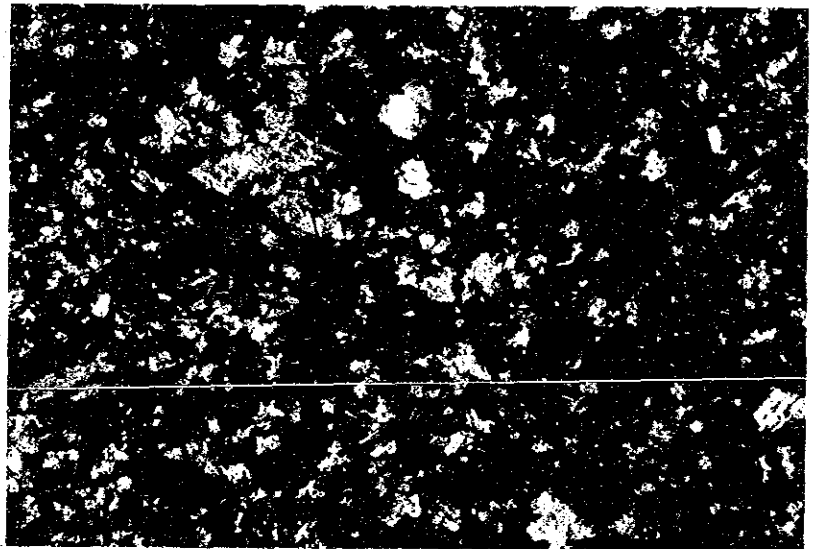
Original texture does not remain because of replacement by chlorite and cericite. Some thin gypsum and carbonate veins are observed.

Locality:

Olur Powerhouse Site

Rock Name:

Altered Andesite



0 0.5 1mm ( Crossed nicols )

Petrographic Description:

Chief consisting minerals are plagioclase. Hyalopilitic texture is remarkable. Some rock forming minerals are replaced by kaoline, albite, quartz and carbonate minerals.

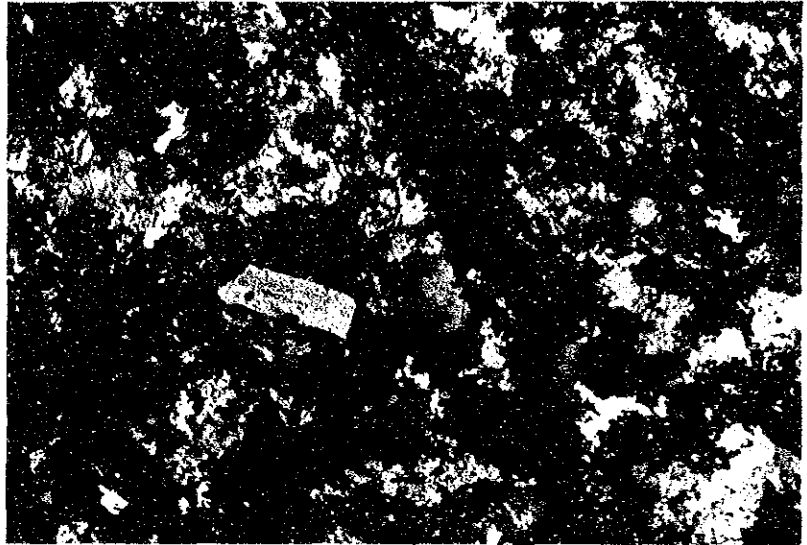
Micrograph and Petrographic Description of Rock ( 3-3 )

Locality:

Ayvali Damsite, Right bank  
Drill Hole SG-105,  
Depth 70.0 m

Rock Name:

Altered Lapilli Tuff



0 0.5 1mm

( Crossed nicols )

Petrographic Description:

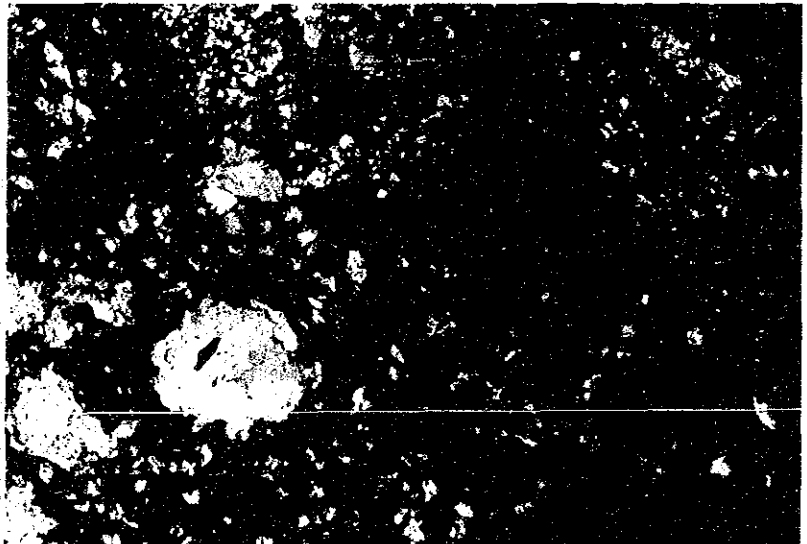
This rock shows pyroclastic texture with mineral fragments of plagioclase and rock fragments suffered chloritization and albitization.

Locality:

Ayvali Damsite, Left bank  
Drill Hole SL-103,  
Depth 87.8 m

Rock Name:

Altered tuff breccia



0 0.5 1mm

( Crossed nicols )

Petrographic Description:

This rock shows pyroclastic texture with fragments of siltstone, silicified rock and chloritization rock. Small amount of pyrite are observed.



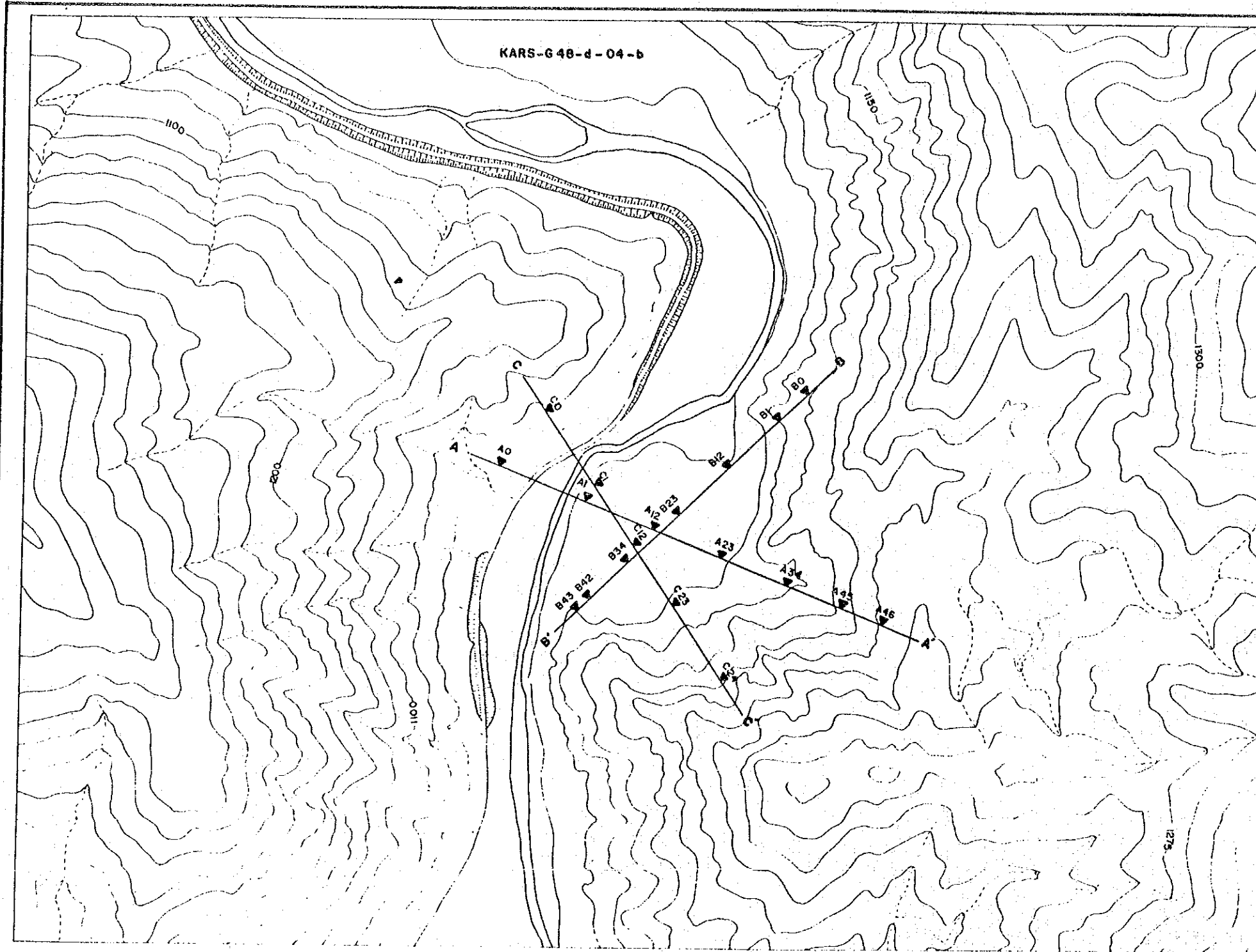
#### A-3-4 Geophysical Prospecting Data

	<u>Page</u>
a) Seismic Prospecting Data of Olur Spillway Site . . .	AP-3-144
b) Seismic Prospecting Data of Olur Powerhouse Site . .	AP-3-147
c) Seismic Prospecting Data of Bahcecik Area . . . . .	AP-3-151
d) Seismic Prospecting Data of Anzav Valley . . . . .	AP-3-156
e) Seismic Prospecting Data of Ayvali Powerhouse Access Tunnel . . . . .	AP-3-160
f) Electrical Prospecting Data of Tkeli Borrow Area (Olur) . . . . .	AP-3-164

Note:

Details of each data are described in the following reports.

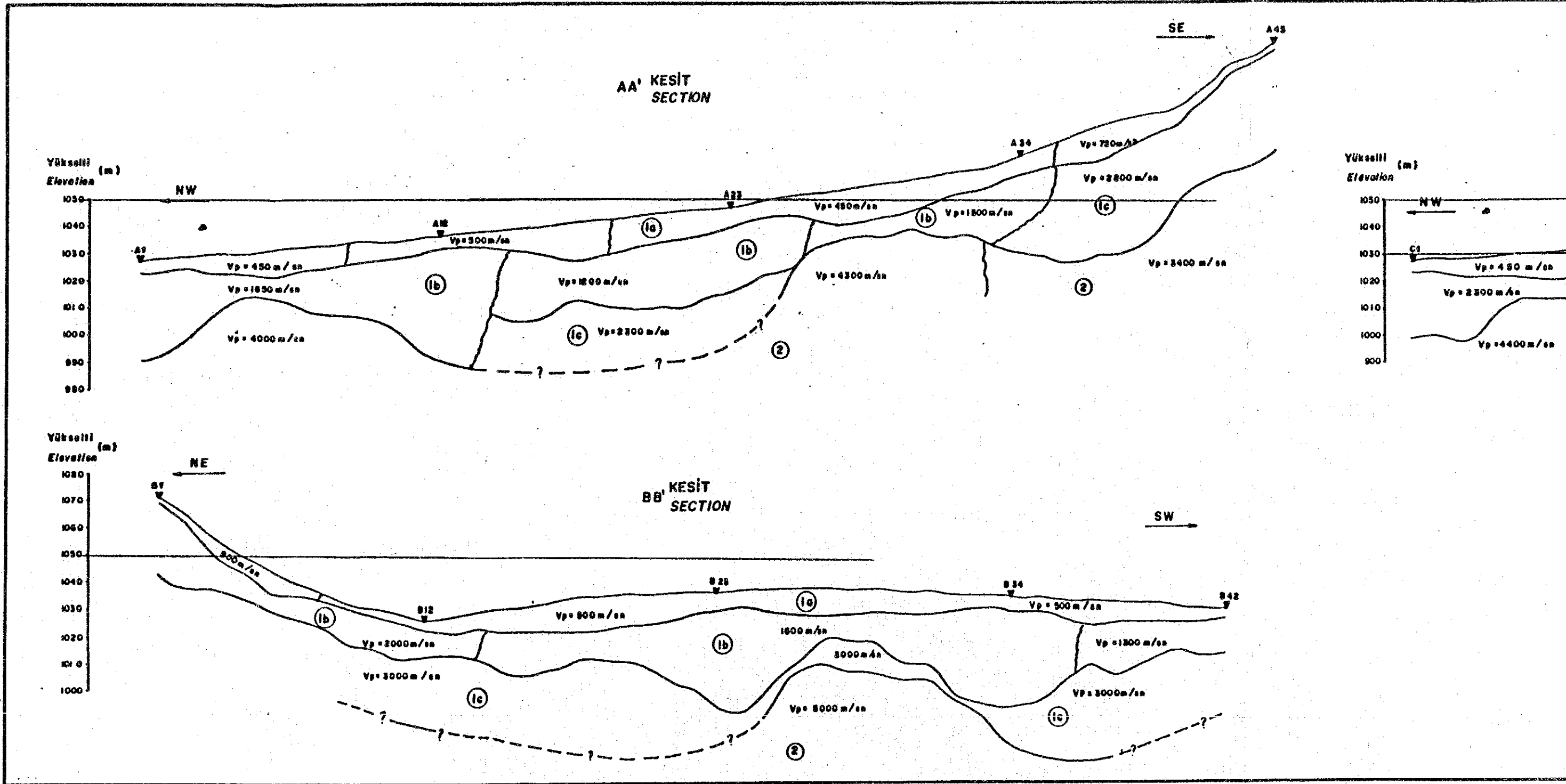
- a) and e) : "Coruh-Oltu-Olur Dam and Powerhouse Site, Olur Spillway and Ayvali Access Tunnel Sites Geophysical Preliminary Study Report." by EIE, 1992
- b) and d) : "Coruh-Oltu-Olur Dam and Powerhouse Site, and Ayvali Dam and Powerhouse Site, Tunnel Route Geophysical Preliminary Study Report." by EIE, 1991
- c) : "Coruh-Oltu-Olur Project, Bahcecik Landslide Area Geophysical Preliminary Study Report" by EIE, 1992
- f) and g) : "Coruh-Oltu-Ayvali Project Bulanik and Tekeli Borrow Areas Geophysical Preliminary Study Report." by EIE, 1992



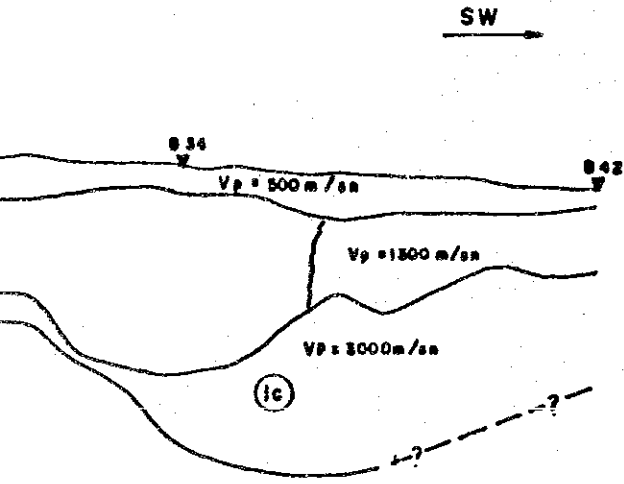
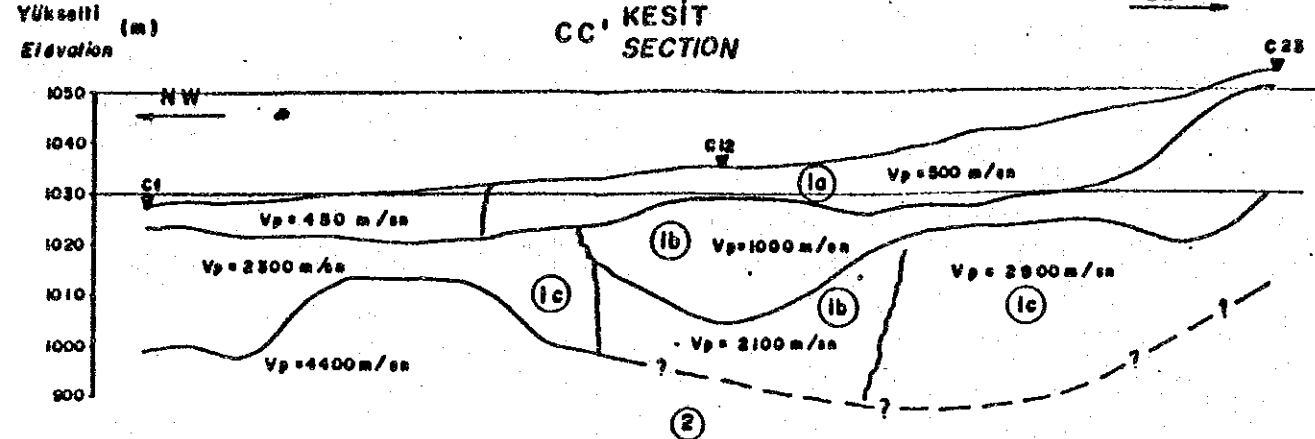
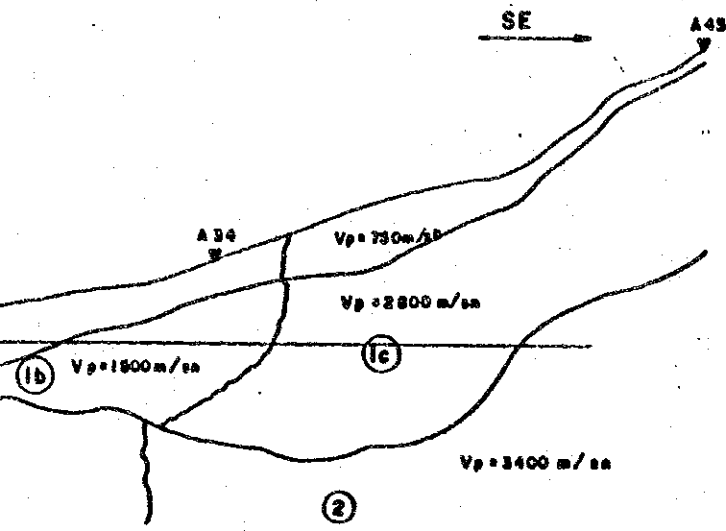
**AÇIKLAMA — EXPLANATION**

- A — A' SİSMİK PROFİL  
SEISMIC PROFILE
- B 1 SİSMİK ATIŞ NOKTASI  
SEISMIC SHOT POINT

ELEKTRİK İŞLERİ ETÜY İDARESİ GENEL MÜDÜRLÜĞÜ GENERAL DIRECTORATE OF ELECTRICAL POWER RESOURCES SURVEY AND DEVELOPMENT ADMINISTRATION			
ÇORUH - OLTU KOLU ÖLÜR BARAJ VE HES PROJESİ DOLUSAVAK SAHASI JEOFİZİK ÇALIŞMA LOKASYON HARİTASI ÇORUH - OLTU - ÖLÜR DAM AND HPP PROJECT GEOPHYSICAL SURVEY LOCATION MAP OF SPILLWAY SITE			
YAPAN DESIGNED BY: N SARAÇ F. ÇAKAN	DAİRE BAŞKANI HEAD OF DEPART.		
GİZEN DRAWN BY: Sarhat ARAYANCAN			
KONTROL CHECKED BY:			
ŞUBE MD CHIEF OF DIVIS:	GENEL MÜDÜR GENERAL DIRECTOR		
No	ÖLÇEK SCALE		EK App
Tarih Date: 19.3.1992	1/5000		1



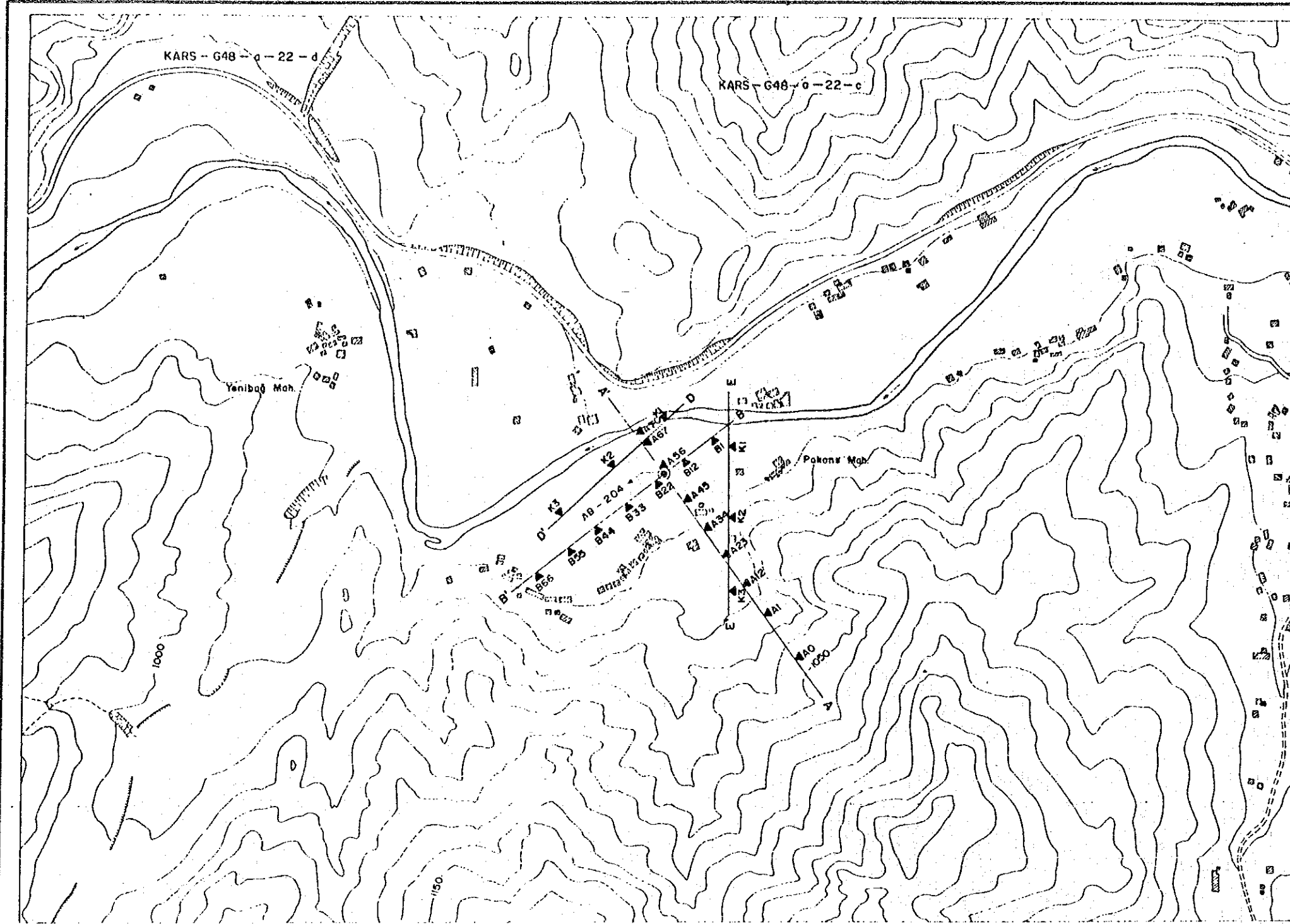
P.25.10.72



**AÇIKLAMALAR — EXPLANATION**

- A34 ▼ SİSMİK ATIŞ NOKTASI  
SHOT POINT
- Vp = 2100 m/sn BOYUNA DALGA HIZI  
LONGITUDINAL WAVE VELOCITY
- OLASI TABAKA SINIRI  
PROBABLE CON. ?
- (a) (b) (c) YAMAÇ MOLOZU  
SLOPE WASH
- (2) TABANKAYA (AYVALI VOLKANİTLERİ)  
BEDROCK (AYVALI VOLCANICS)

ELEKTRİK İŞLERİ ETÜT İDARESİ GENEL MÜDÜRLÜĞÜ GENERAL DIRECTORATE OF ELECTRICAL POWER RESOURCES SURVEY AND DEVELOPMENT ADMINISTRATION			
ÇORUH-OLTU KOLU OLUR BARAJ ve HES PROJESİ DOLUSAVAK SAHASI JEOFİZİK KESİTLERİ ÇORUH-OLTU-OLUR DAM AND HPP PROJECT GEOPHYSICAL SECTION OF SPILLWAY SITE			
YAPAN DESIGNED BY : NSARAC, F. ÇAKAN, Ö. TEKELİ		DARE BAŞKANI HEAD OF DEPT	
ÇİZEN DRAWN BY : Melice ALTIN		<i>[Signature]</i>	
KONTROL CHECKED BY : <i>[Signature]</i>		<i>[Signature]</i>	
ŞUBE MÜD. CH. OF DIVS : <i>[Signature]</i>		GENEL MÜDÜR GENERAL DIRECTOR	
No :	ÖLÇEK SCALE		EK App : 2
Tarih Date : 16 / 3 / 1992	1 / 1000		

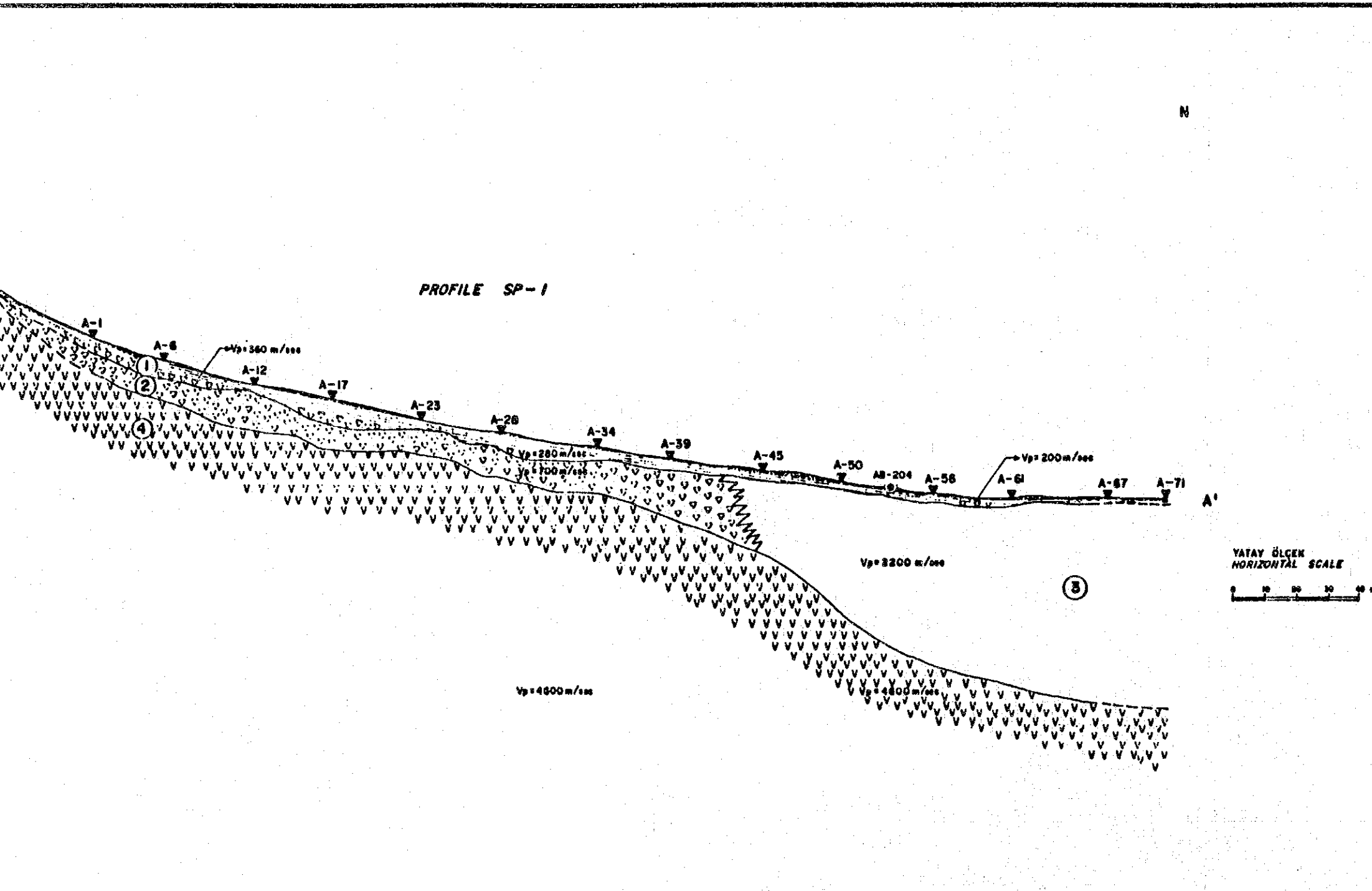


**AÇIKLAMA - EXPLANATION**

- A — A' SİSMİK PROFİL  
SEISMIC PROFILE
- AS KI SİSMİK ATIŞ NOKTASI  
SHOT POINT
- ⊙ MEKANİK SONDAJ  
DRILL HOLE (PROPOSED)

ELEKTRİK İŞLERİ ETÜT. İDARESİ GENEL MÜDÜRLÜĞÜ GENERAL DIRECTORATE OF ELECTRICAL POWER RESOURCES SURVEY AND DEVELOPMENT ADMINISTRATION			
<b>ÇORUH-OLTU KOLU OLUR BARAJ VE HES PROJESİ SANTRAL SAHASI JEOFİZİK ÇALIŞMA LOKASYON HARİTASI OLTU-OLUR HPP PROJECT GEOPHYSICAL SURVEY LOCATION MAP FOR POWERHOUSE AREA</b>			
YAPAN DESIGNED BY	N. SARAC S. ERKAN	DAİRE BAŞKANI HEAD OF DEPART.	<i>[Signature]</i>
ÇİZEN DRAWN BY	Sibel GÖCER	KONTROL CHECKED	<i>[Signature]</i>
SÜBE MD. CHIEF OF DIVISION	<i>[Signature]</i>	GENEL MÜDÜR Y. GENERAL DIRECTOR	<i>[Signature]</i>
No. No.	ÖLÇEK SCALE	EK	App
Tarih Date	17. 9. 1991	1 / 3000	1





**ACIKLAMA - EXPLANATION**

- A-1 BİSMİK ATIŞ NOKTASI  
SHOT POINT
- $V_p = 2200 \text{ m/sec}$  BOYUNA DALGA HIZI  
LONGITUDINAL WAVE VELOCITY
- OLASI TABAKA SINIRI  
PROBABLE CONTACT
- ~ ~ ~ YANAL DEĞİŞİM SINIRI  
LATERAL CHANGE BOUNDARIES
- ① BİTKİSEL TOPRAK  
AGRICULTURAL SOIL
- ② YAMAÇ MOLOZU  
SLOPE WASH
- ③ ALÜVYON  
ALLUVIUM
- ④ TABAN KAYA (AYVALI VOLKANİTLERİ)  
BEDROCK (AYVALI VOLCANICS)

ELEKTRİK İŞLERİ ETÜT İDARESİ GENEL MÜDÜRLÜĞÜ GENERAL DIRECTORATE OF ELECTRICAL POWER RESOURCES SURVEY AND DEVELOPMENT ADMINISTRATION			
CORUH-OLTU KOLU OLUR BARAJ VE HES PROJESİ SANTRAL SAHASI JEOFİZİK KESİTİ CORUH-OLTU-OLUR HPP PROJECT GEOPHYSICAL SECTIONS AT POWERHOUSE SITE			
YAPAN DESIGNED BY : N. BARAÇ & TEKELİ	DAİRE BAŞKANI HEAD OF DEPART.		
ÇİZEN DRAWN BY : Erol GÖÇER	<i>[Signature]</i>		
KONTROL CHECKED : <i>[Signature]</i>	GENEL MÜDÜR GENERAL DIRECTOR		
SUBE MD CHIEF OF DIVISION <i>[Signature]</i>			
No : Tarih : 10.9.1991	ÖLÇEK SCALE 1/1000		Ek App : 2

**AÇIKLAMA - EXPL**

B-6 BİSİKLET ATIŞ NOKTASI  
SHOT POINT

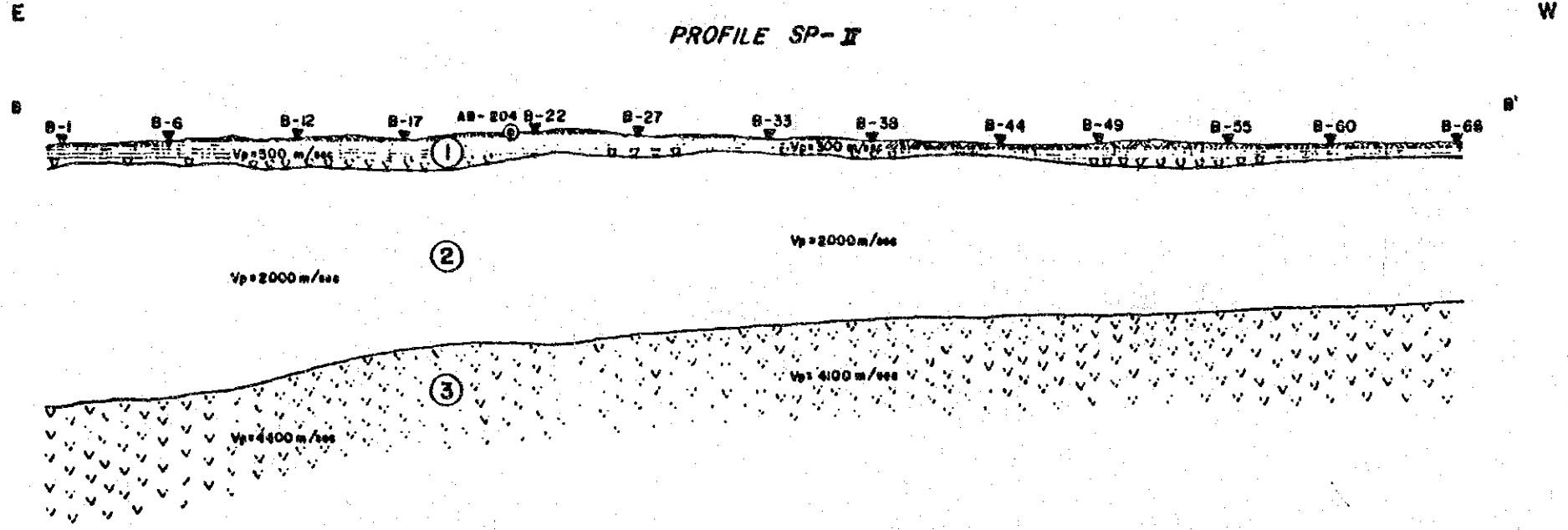
Vp=4400 m/sec BOYUNA DALGA  
LONGITUDINAL

① BİTKİSEL TOPRAK  
AGRICULTURAL

② ALÜVİYON  
ALLUVIUM

③ TABAKAYA  
BEDROCK

YÜKSELTİ - ELEVATION (m)  
940  
920  
900



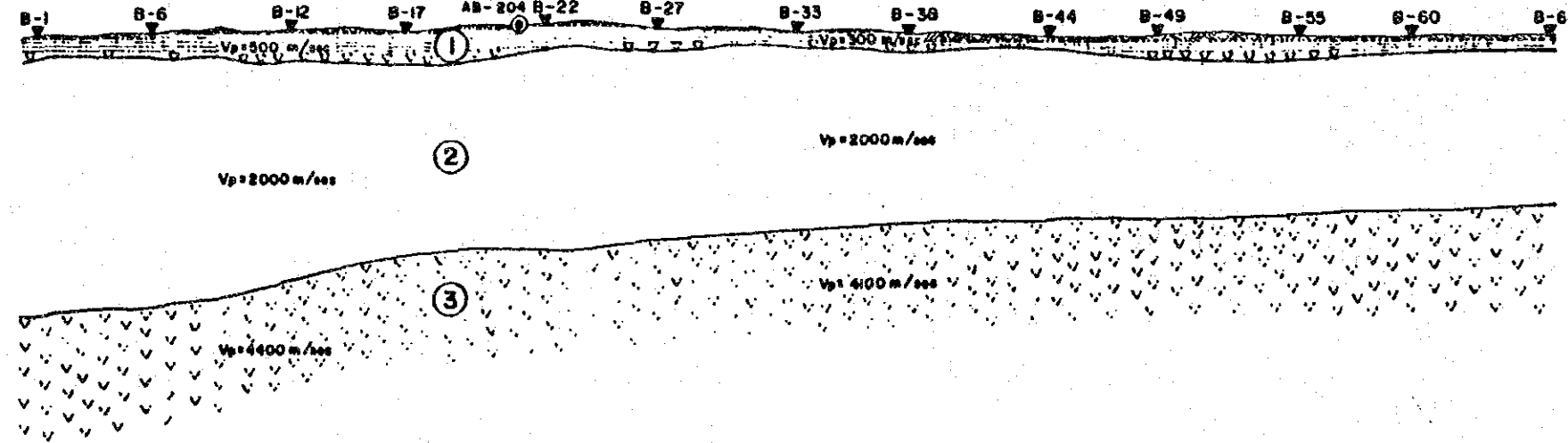
YATAY ÖLÇEK  
HORIZONTAL SCALE  
0 10 20 30 40

7/2/77

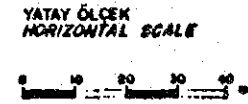
ELEKTRİK İŞLERİ ETÜT İDARESİ GENERAL DIRECTORATE OF ELECTRIC SURVEY AND DEVELOPMENT A		
ÇORUH-OLTU KOLU OLUR PROJESİ SANTRAL SAHASI ÇORUH-OLTU-OLUR GEOPHYSICAL SECTIONS AT P		
YAPAN DESIGNED BY	N. BARAÇ Ö. TEKELİ	DAİRE B HEAD OF
ÇİZEN DRAWN BY	B. M. GÖÇER	
KONTROL CHECKED	u. h. u.	
SUBE MD. CHIEF OF DIVISION	Ş. ERGİN	GENEL MANAGER
No. No	ÖLÇEK SCALE	
Yapın Date	29.8.1991	1/1000



PROFILE SP- I



W

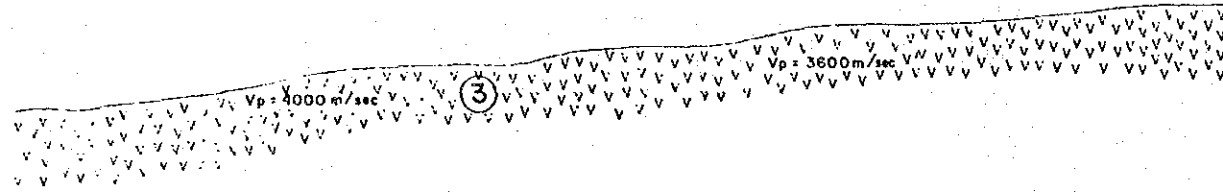
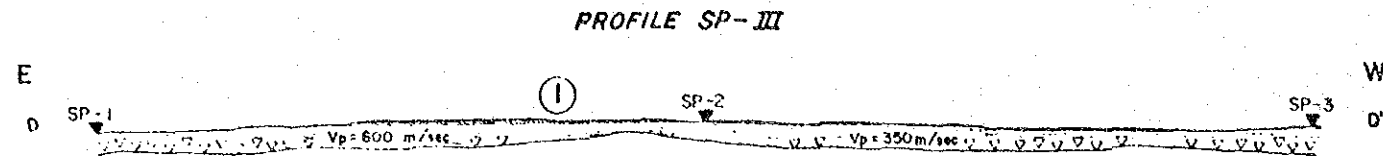


AÇIKLAMA - EXPLANATION

- B-6 SİSİK ATIŞ NOKTASI  
SHOT POINT
- Vp=4400 m/sec BOYUNA DALGA HIZI  
LONGITUDINAL WAVE VELOCITY
- ① BİTKİSEL TOPRAK + ALÜVYON  
AGRICULTURAL SOIL + ALLUVIUM
- ② ALÜVYON  
ALLUVIUM
- ③ TABANKAYA  
BEDROCK

ELEKTRİK İŞLERİ ETÜT İDARESİ GENEL MÜDÜRLÜĞÜ GENERAL DIRECTORATE OF ELECTRICAL POWER RESOURCES SURVEY AND DEVELOPMENT ADMINISTRATION			
ÇORUH-OLTU KOLU OLUR BARAJ VE HES PROJESİ SANTRAL SAHASI JEOFİZİK KESİTİ ÇORUH-OLTU-OLUR HPP PROJECT GEOPHYSICAL SECTIONS AT POWERHOUSE SITE			
YAPAN DESIGNED BY : N. BARAÇ	D. TEKELİ S. ERİTAN	DAİRE BAŞKANI HEAD OF DEPART	<i>[Signature]</i>
ÇİZEN DRAWN BY : S.M. GÖÇER		KONTROL CHECKED : <i>[Signature]</i>	
SÜBE MD. CHIEF OF DIVISION : <i>[Signature]</i>		GENEL MÜDÜR GENERAL DIRECTOR : <i>[Signature]</i>	
No : Scale :	ÖLÇEK SCALE : 1/1000		Ek : App : 3
Tarih : 28.8.1991			

YUKSELTİ - ELEVATION (m)  
940  
920  
900

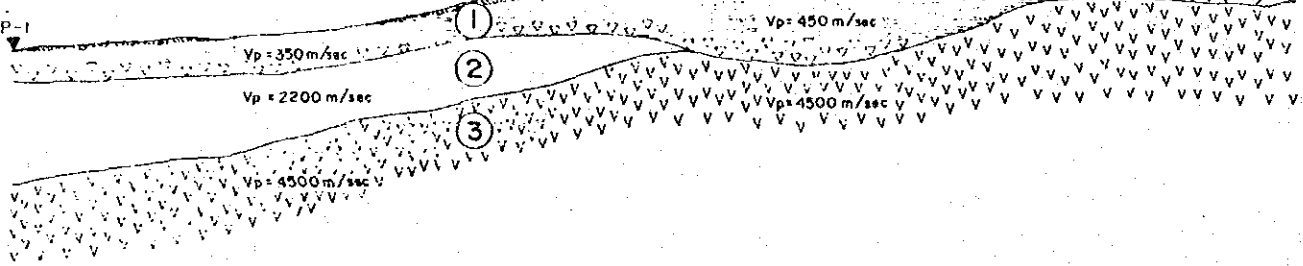
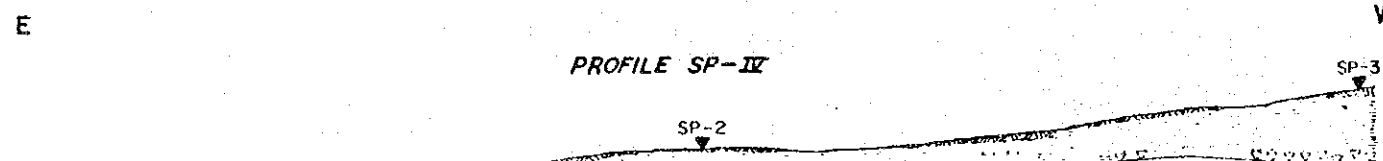


YATAY ÖLÇEK  
HORIZONTAL SCALE  
0 10 20 30 40 m

**AÇIKLAMA - EXPLANATION**

- SP-1 SİSMİK ATIŞ NOKTASI  
SHOT POINT
- Vp = 2000 m/sec BOYUNA DALGA HIZI  
LONGITUDINAL WAVE VELOCITY
- ① BİTKİSEL TOPRAK + ALÜVYON  
AGRICULTURAL SOIL + ALLUVIUM
- ② ALÜVYON  
ALLUVIUM
- ③ TABANKAYA  
BEDROCK

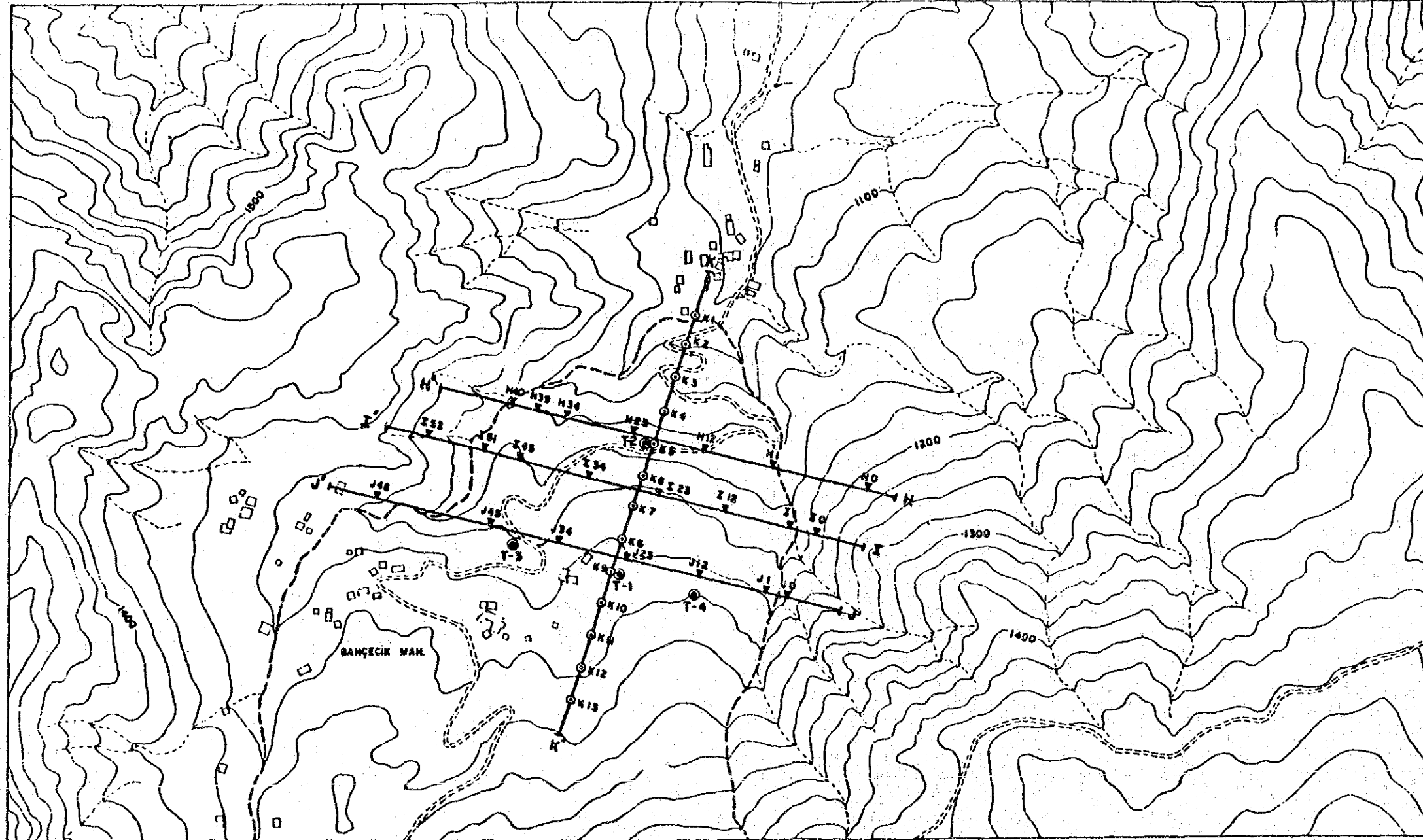
YUKSELTİ - ELEVATION (m)  
960  
940  
920  
900



YATAY ÖLÇEK  
HORIZONTAL SCALE  
0 10 20 30 40 m

ELEKTRİKİSLERİ ETÜT İDARESİ GENEL MÜDÜRLÜĞÜ GENERAL DIRECTORATE OF ELECTRICAL POWER RESOURCES SURVEY AND DEVELOPMENT ADMINISTRATION			
CORUH - OLTU KOLU OLUR BARAJ VE HES PROJESİ SANTRAL SAHASI JEOFİZİK KESİTİ CORUH - OLTU - OLUR HPP PROJECT GEOPHYSICAL SECTIONS AT POWERHOUSE SITE			
YAPAN DESIGNED BY	N. SARAC O. TERELI	DAİRE BAŞKANI HEAD OF DEPART.	
ÇİZEN DRAWN BY	Sibel GÖCER		
KONTROL CHECKED	u. S. S. S.		
SUBE MD. CHIEF OF DIVISION	adnan d. d. d.	GENEL MÜDÜR GENERAL DIRECTOR	
No. No.	ÖLÇEK SCALE		Ek App 4
Date Date	9.9.1991	1/1000	

KARS - 648 - a - 22 - c



AÇIKLAMA - EXPLANATION

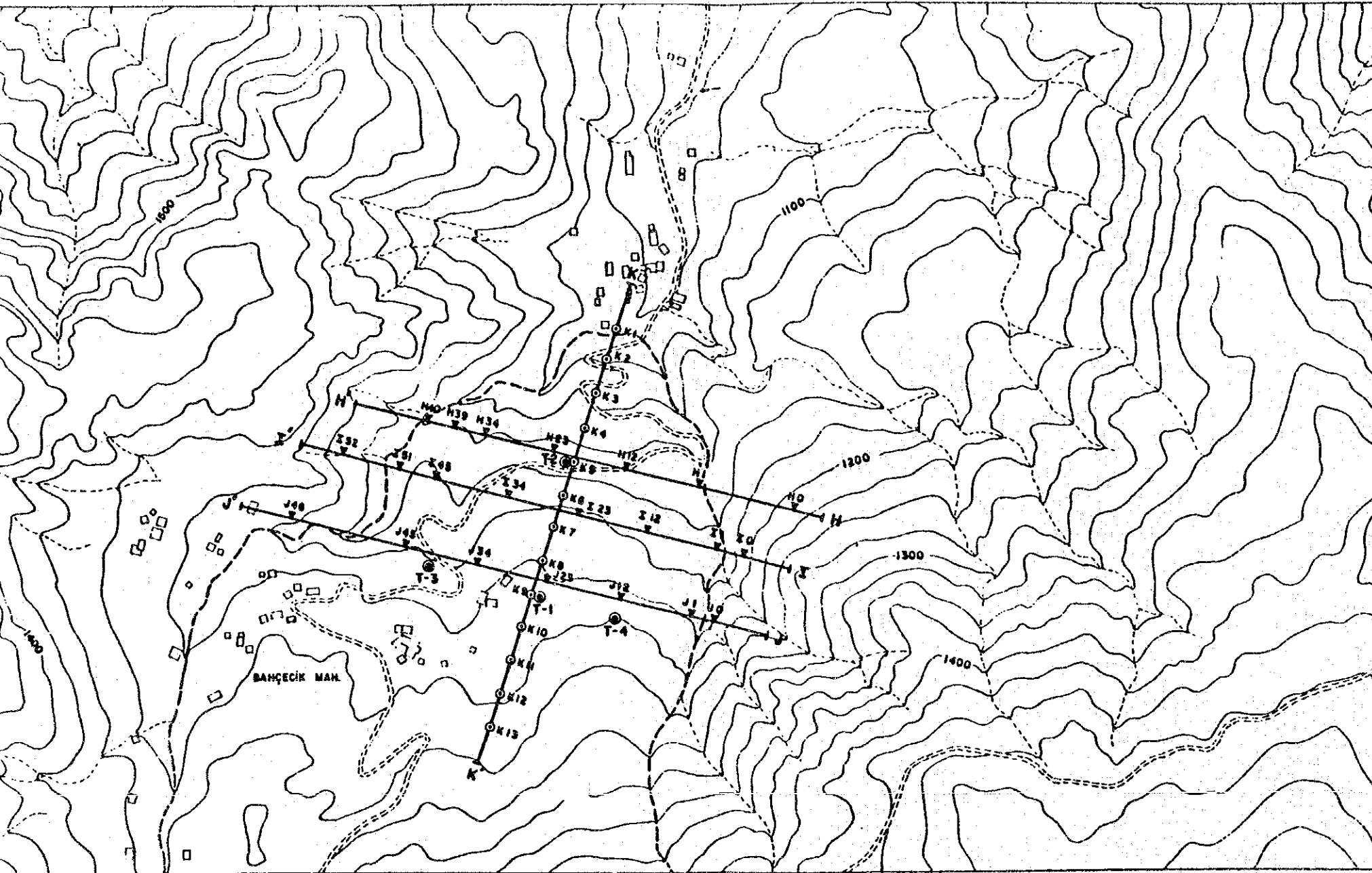
- H — H' SİSMİK PROFİL  
SEISMIC PROFILE
- K — K' REZİSTİVİTE PROFİLİ  
RESISTIVITY PROFILE
- J 33  
▼ SİMİK ATIŞ NOKTASI  
SHOT POINT
- K 4  
○ DÜŞEY ELEKTRİK SONDAJ  
VERTICAL ELECTRICAL SOUNDING
- T-2  
● MEKANİK SONDAJ  
DRILL HOLE

ELEKTRİK İŞLERİ ETÜT İDARESİ GENEL  
GENERAL DIRECTORATE OF ELECTRICAL POWER AND  
SURVEY AND DEVELOPMENT ADMINISTRATION

ÇORUH-OLTU KOLU OLUR BARAJI VE  
BAHÇECİK HEYELANI JEOFİZİK ÇALIŞMA LOKASI  
LOCATION MAP FOR BAHÇECİK LOKASI

YAPAN DESIGNED BY : H. SARAÇ - M. GÖRMÜŞ	DAİRE BAŞKANI HEAD OF DEPT. :
ÇİZEN DRAWN BY : Mehmet PEKDEMİR	
KONTROL CHECKED : <i>[Signature]</i>	
ŞUBE MÜDÜRÜ CHIEF OF DIVISION : <i>[Signature]</i>	GENEL MÜDÜR GENERAL DIRECTOR : <i>[Signature]</i>
No. No. :	ÖLÇEK SCALE :
Tarih Date : 24. 8. 1992	1 / 5000

KARS - G48 - e - 22 - c



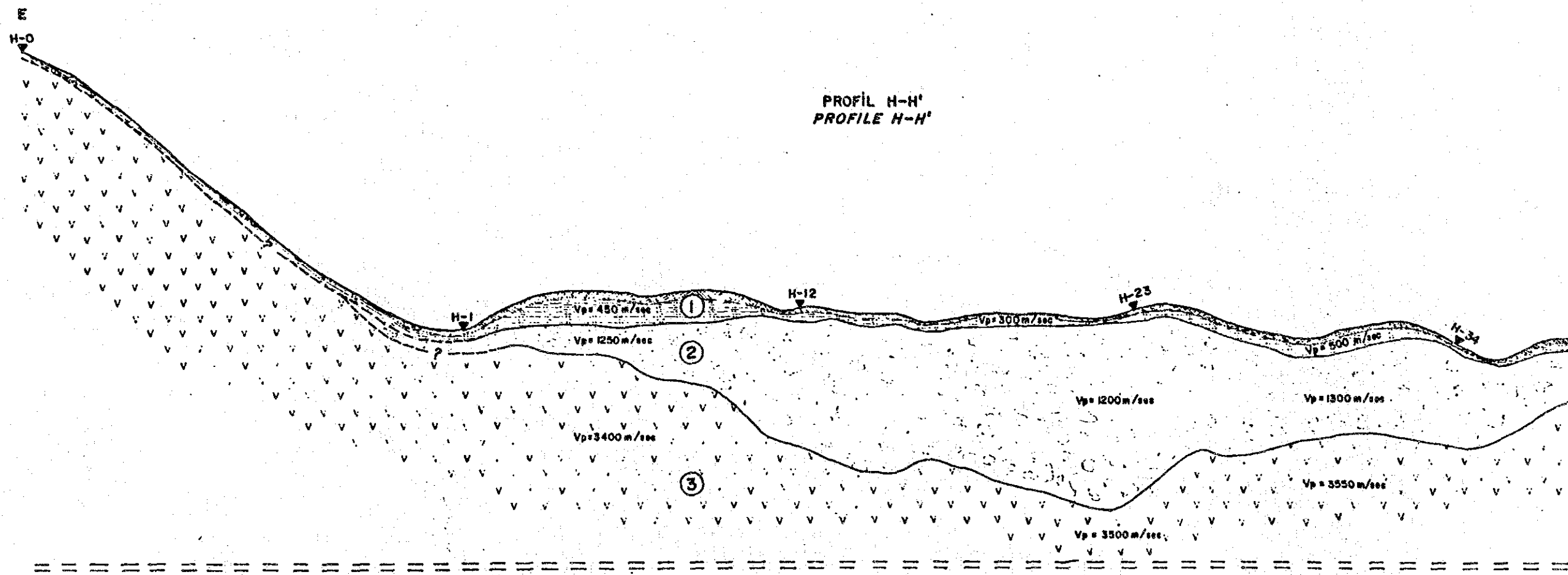
**AÇIKLAMA - EXPLANATION**

- H — H' SİSMİK PROFİL  
SEISMIC PROFILE
- K — K' REZİSTİVİTE PROFİLİ  
RESISTIVITY PROFILE
- J 23  
▼ SİSMİK ATIŞ NOKTASI  
SHOT POINT
- K 4  
○ DÜŞEY ELEKTRİK SONDAJ  
VERTICAL ELECTRICAL SOUNDING
- T-2  
● MEKANİK SONDAJ  
DRILL HOLE

ELEKTRİK İŞLERİ ETÜT İDARESİ GENEL MÜDÜRLÜĞÜ GENERAL DIRECTORATE OF ELECTRICAL POWER RESOURCES SURVEY AND DEVELOPMENT ADMINISTRATION	
ÇORUH-OLTU KOLU OLUR BARAJ ve HES PROJESİ BAHÇECİK HEYELANI JEOFİZİK ÇALIŞMA LOKASYON HARİTASI LOCATION MAP FOR BAHÇECİK LANDSLIDE	
YAPAN DESIGNED BY : N. BARAÇ - N. GÖRMÜŞ	DAİRE BAŞKANI HEAD OF DEPART. <i>[Signature]</i>
ÇİZEN DRAWN BY : Mehmet PEKDEMİR	
KONTROL CHECKED : <i>[Signature]</i>	
BÜŞE MÜD. CHIEF OF DIVISION : <i>[Signature]</i>	GENEL MÜDÜR GENERAL DIRECTOR <i>[Signature]</i>
No. No. : 24.6.1992	ÖLÇEK SCALE : 1/5000
	Ek App : 1

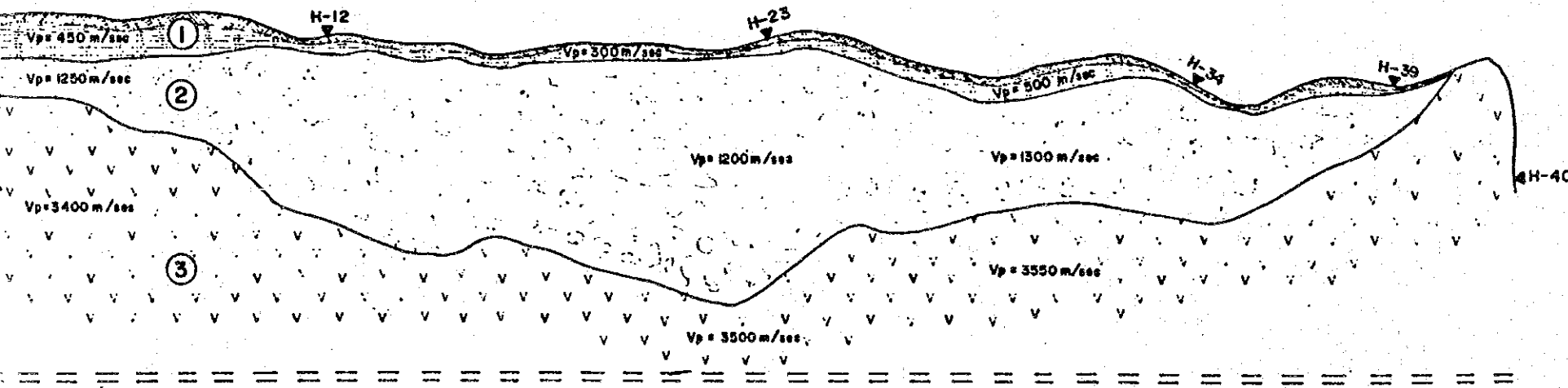
YÜKSELTİ - ELEVATION (m)  
1220  
1200  
1150  
1100  
1050

PROFIL H-H'  
PROFILE H-H'





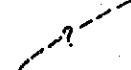



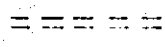
7017472

PROFİL H-H'  
PROFILE H-H'



YATAY ÖLÇEK  
HORIZONTAL SCALE 1/1000  
0 10 20 30 40 50

AÇIKLAMA—EXPLANATION

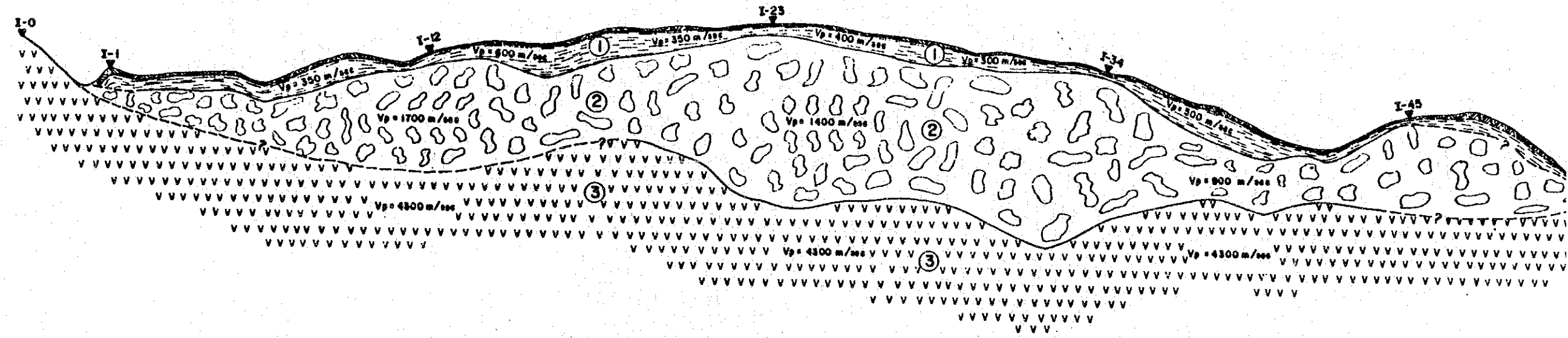
- H-23  SİSMİK ATIŞ NOKTASI  
SHOT POINT
- Vp=1200 m/sec  BOYUNA DALGA HIZI  
LONGITUDINAL WAVE VELOCITY
-  OLASI TABAKA SINIRI  
PROBABLE CONTACT
-  ① HEYELAN MALZEMESİ  
LANDSLIDE MATERIAL
-  ② HEYELAN MALZEMESİ  
LANDSLIDE MATERIAL
-  ③ TABANKAYA (AYVALI VOLKANİTLERİ)  
BEDROCK (AYVALI VOLCANICS)
-  OLASI ENERJİ TÜNELİ  
PROBABLE ENERGY TUNNEL

ELEKTRİK İŞLERİ ETÜT İDARESİ GENEL MÜDÜRLÜĞÜ GENERAL DIRECTORATE OF ELECTRICAL POWER RESOURCES SURVEY AND DEVELOPMENT ADMINISTRATION			
ÇORUH-OLTU KOLU OLUR BARAJ VE HES PROJESİ BAHÇECİK HEYELANI JEOFİZİK KESİTİ GEOPHYSICAL SECTION OF BAHÇECİK LANDSLIDE			
YAPAN DESIGNED BY : N. SARAÇ Ö. TEKELİ	DAİRE BAŞKANI HEAD OF DEPART. <i>[Signature]</i>		
ÇİZEN DRAWN BY : Sibel GÖÇER	KONTROL CHECKED : <i>[Signature]</i>		
SÜBE MD. CHIEF OF DIVISION : <i>[Signature]</i>	GENEL MÜDÜR GENERAL DIRECTOR <i>[Signature]</i>		
No. No	ÖLÇEK SCALE		Ek App 2
Tarih Date	27.8.1991	1/1000	

YUKSELTİ-ELEVATION (m)

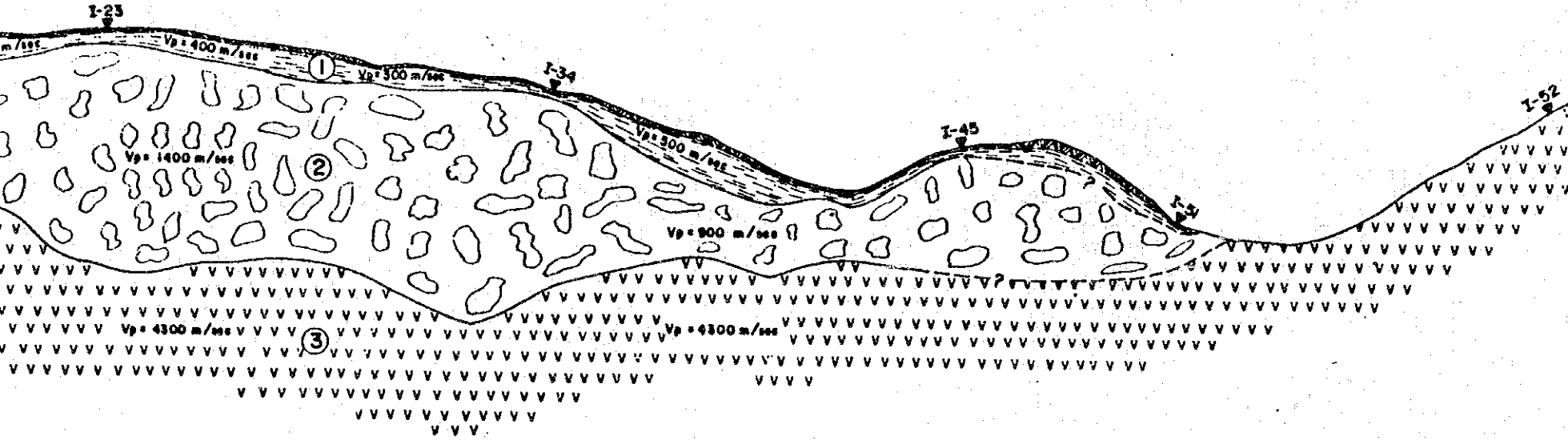
1250  
1200  
1150  
1100  
1050

PROFIL I-I'  
PROFILE I-I'



764-1501

PROFİL I-I'  
PROFILE I-I'



YATAY ÖLÇEK  
HORIZONTAL SCALE 1/1000  
0 10 20 30 40

AÇIKLAMA -- EXPLANATION

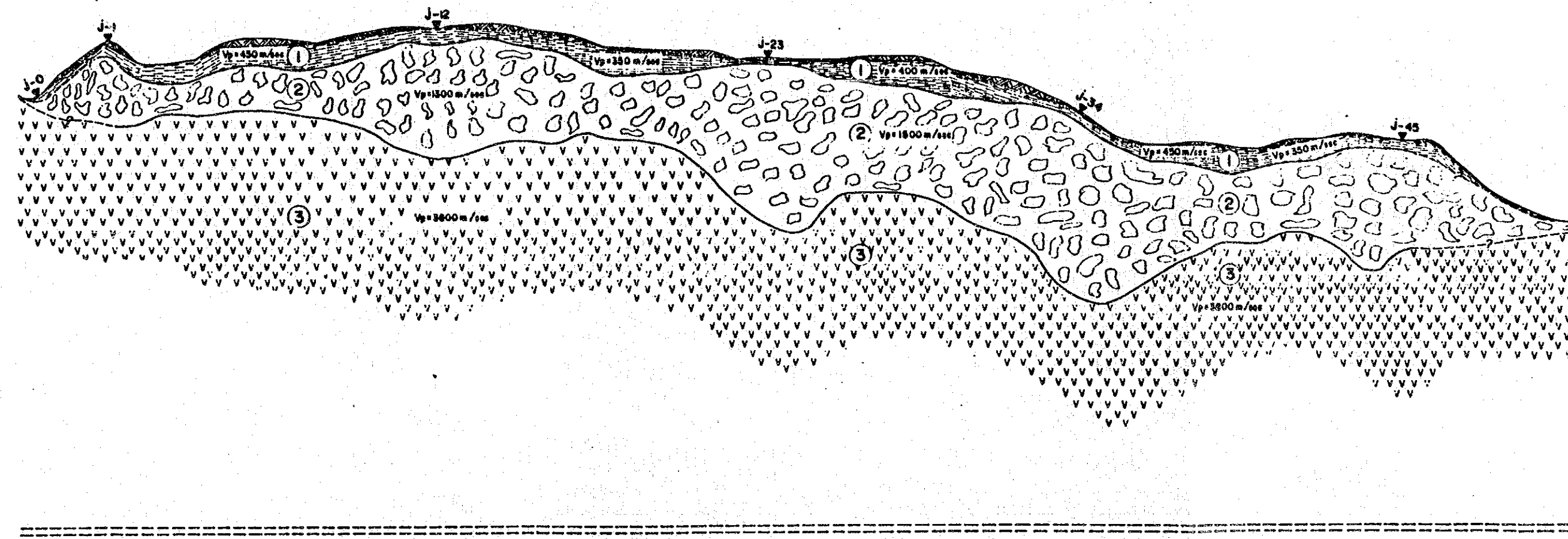
- I-34 SİSMİK ATIŞ NOKTASI  
SHOT POINT
- Vp = 1400 m/sec BOYUNA DALGA HIZI  
LONGITUDINAL WAVE VELOCITY
- OLASI TABAKA SINIRI  
PROBABLE CONTACT
- ① HEYELAN MALZEMESİ  
LANDSLIDE MATERIAL
- ② HEYELAN MALZEMESİ  
LANDSLIDE MATERIAL
- ③ TABAN KAYA (AYVALI VOLKANİTLER)  
BEDROCK (AYVALI VOLCANICS)
- OLASI ENERJİ TÜNELİ  
PROBABLE ENERGY TUNNEL

ELEKTRİK İŞLERİ ETÜT İDARESİ GENEL MÜDÜRLÜĞÜ GENERAL DIRECTORATE OF ELECTRICAL POWER RESOURCES SURVEY AND DEVELOPMENT ADMINISTRATION			
ÇORUH-OLTU KOLU OLUR BARAJ ve HES PROJESİ BAHÇECİK HEYELANI JEOFİZİK KESİTİ GEOPHYSICAL SECTION OF BAHÇECİK LANDSLIDE			
YAPAN DESIGNED BY : N. SARAÇ H. GÖRMÜŞ	DAİRE BAŞKANI HEAD OF DEPART. <i>[Signature]</i>		
ÇİZEN DRAWN BY : Sibel GÖÇER	KONTROL CHECKED : <i>[Signature]</i>		
SUBE MÜDÜR CHIEF OF DIVISION : <i>[Signature]</i>	GENEL MÜDÜR GENERAL DIRECTOR : <i>[Signature]</i>		
No. No.	ÖLÇEK SCALE		Ek App : 3
Tarih Date : 26.6.1992	1/1000		



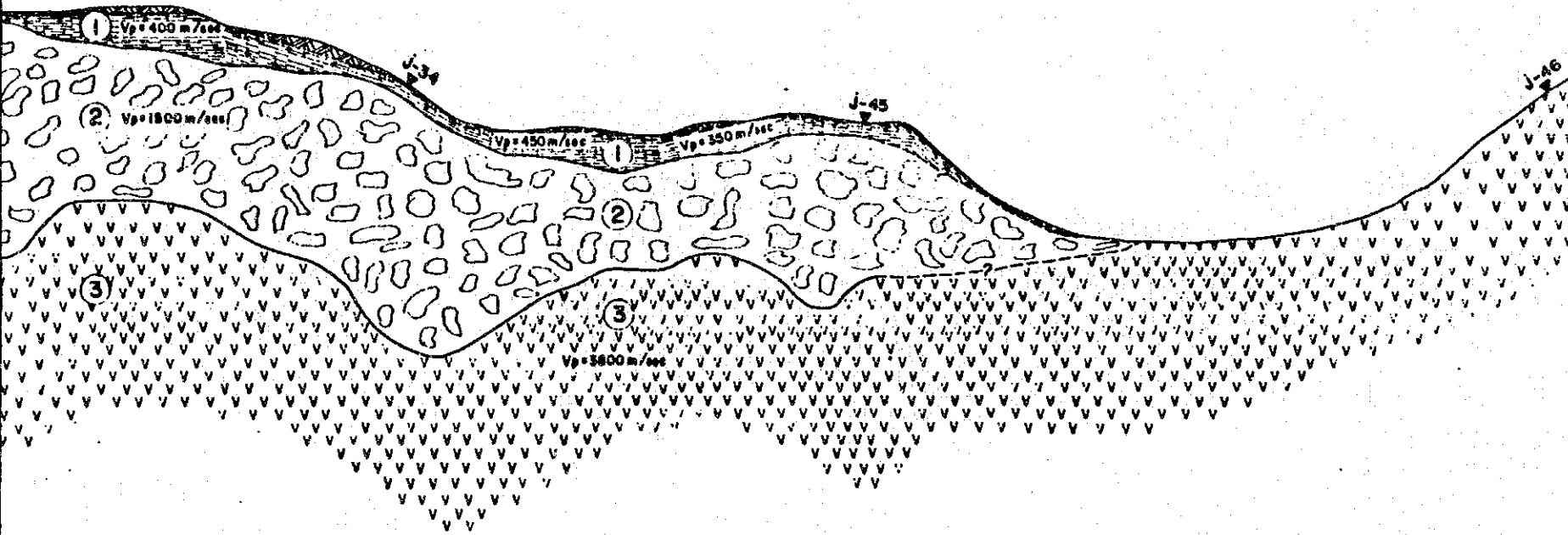
YÜKSELTİ - ELEVATION (m)  
1250  
1200  
1150  
1100  
1050

PROFIL J-J'  
PROFILE J-J'



Handwritten signature or mark.

PROFIL J-J'  
PROFILE J-J'



YATAY ÖLÇEK  
HORIZONTAL SCALE 1/1000

**ACIKLAMA - EXPLANATION**

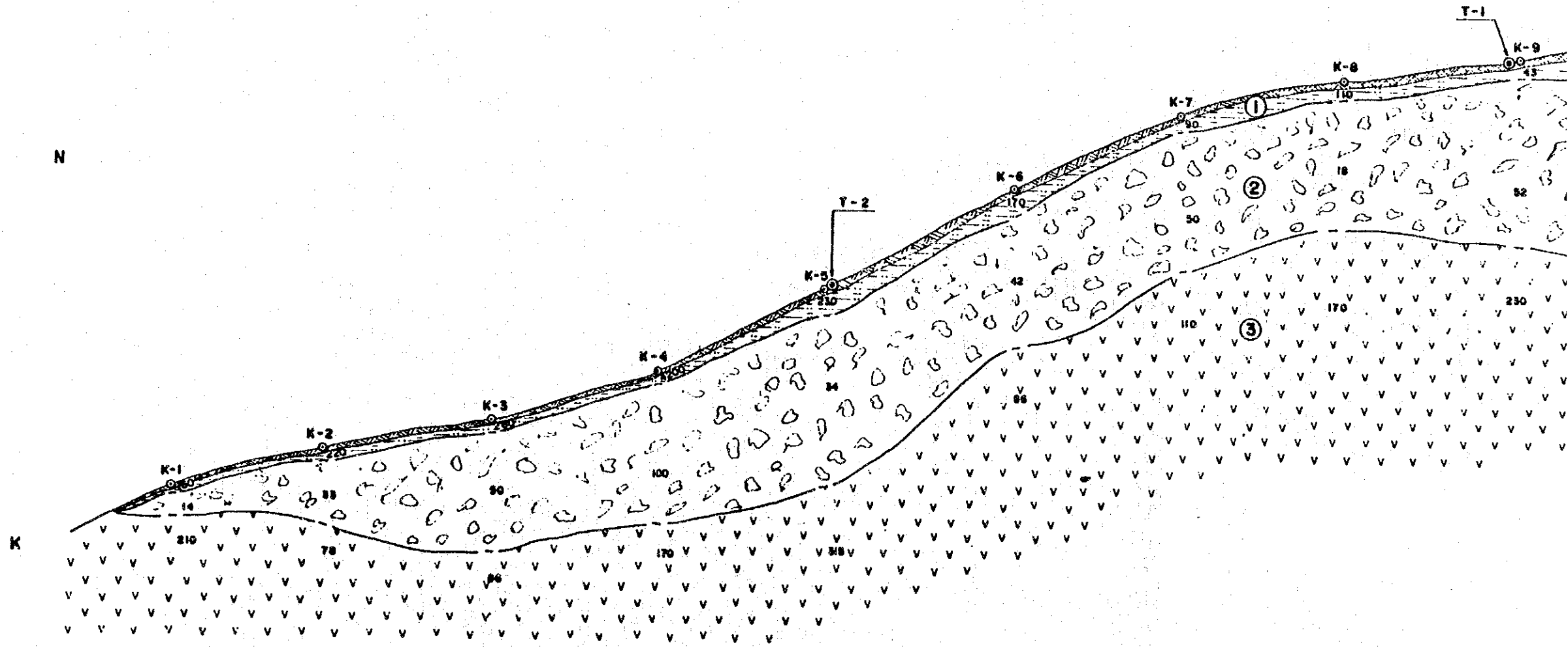
- J-23 SİSMİK ATIŞ NOKTASI  
SHOT POINT
- Vp = 3800 m/sec BOYUNA DALGA HIZI  
LONGITUDINAL WAVE VELOCITY
- OLASI TABAKA SINIRI  
PROBABLE CONTACT
- ① HEYELAN MALZEMESİ  
LANDSLIDE MATERIAL
- ② HEYELAN MALZEMESİ  
LANDSLIDE MATERIAL
- ③ TABAKAYA (AYVALI VOLKANTLERİ)  
BEDROCK (AYVALI VOLCANICS)
- OLASI ENERJİ TÜNELİ  
PROBABLE ENERGY TUNNEL

ELEKTRİK İŞLERİ ETÜT İDARESİ GENEL MÜDÜRLÜĞÜ GENERAL DIRECTORATE OF ELECTRICAL POWER RESOURCES SURVEY AND DEVELOPMENT ADMINISTRATION			
ÇORLU-OLTU KOLU OLUR BARAJ ve HES PROJESİ BAHÇECİK HEYELANI JEOPİZİK KESİTİ GEOPHYSICAL SECTION OF BAHÇECİK LANDSLIDE			
YAPAN DESIGNED BY	M. BARAÇ H. GÖRÜŞ	DAİRE BAŞKANI HEAD OF DEPART.	<i>[Signature]</i>
ÇİZEN DRAWN BY	SİMİN GÖÇER	GENEL MÜDÜR GENERAL DIRECTOR	<i>[Signature]</i>
KONTROL CHECKED	<i>[Signature]</i>		
ŞUBE MD. CHIEF OF DIVISION	<i>[Signature]</i>		
No. No.	ÖLÇEK SCALE		EK APP 4
Tarih Date	24.6.1992	1/1000	

YÜKSELTİ (m)  
ELEVATION (m)

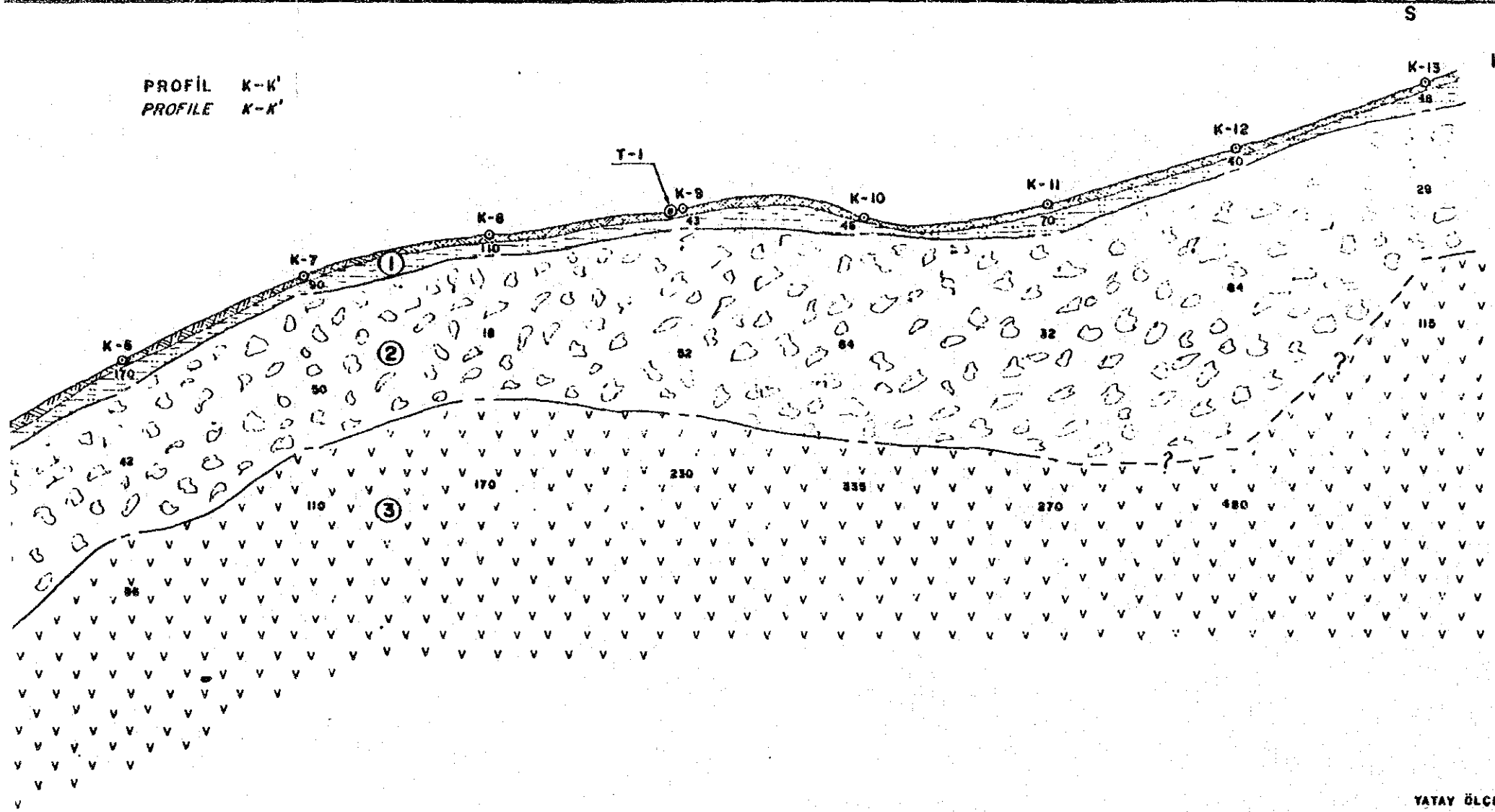
1230  
1200  
1150  
1100  
1050  
1000

PROFIL K-K'  
PROFILE K-K'



PA 572

PROFİL K-K'  
PROFILE K-K'



AÇIKLAMA - EXPLANATION

K-7  
○ DÜSEY ELEKTRİK SONDAJ  
VERTICAL ELECTRICAL SOUNDING

T-1  
⊙ MEKANİK SONDAJ  
DRILL HOLE

270  
ÖZDİRENC (Ohm-m)  
RESISTIVITY

--- ? ---  
OLASI TABAKA SINIRI  
PROBABLE CONTACT

① HEYELAN MALZEMESİ  
LANDSLIDE MATERIAL

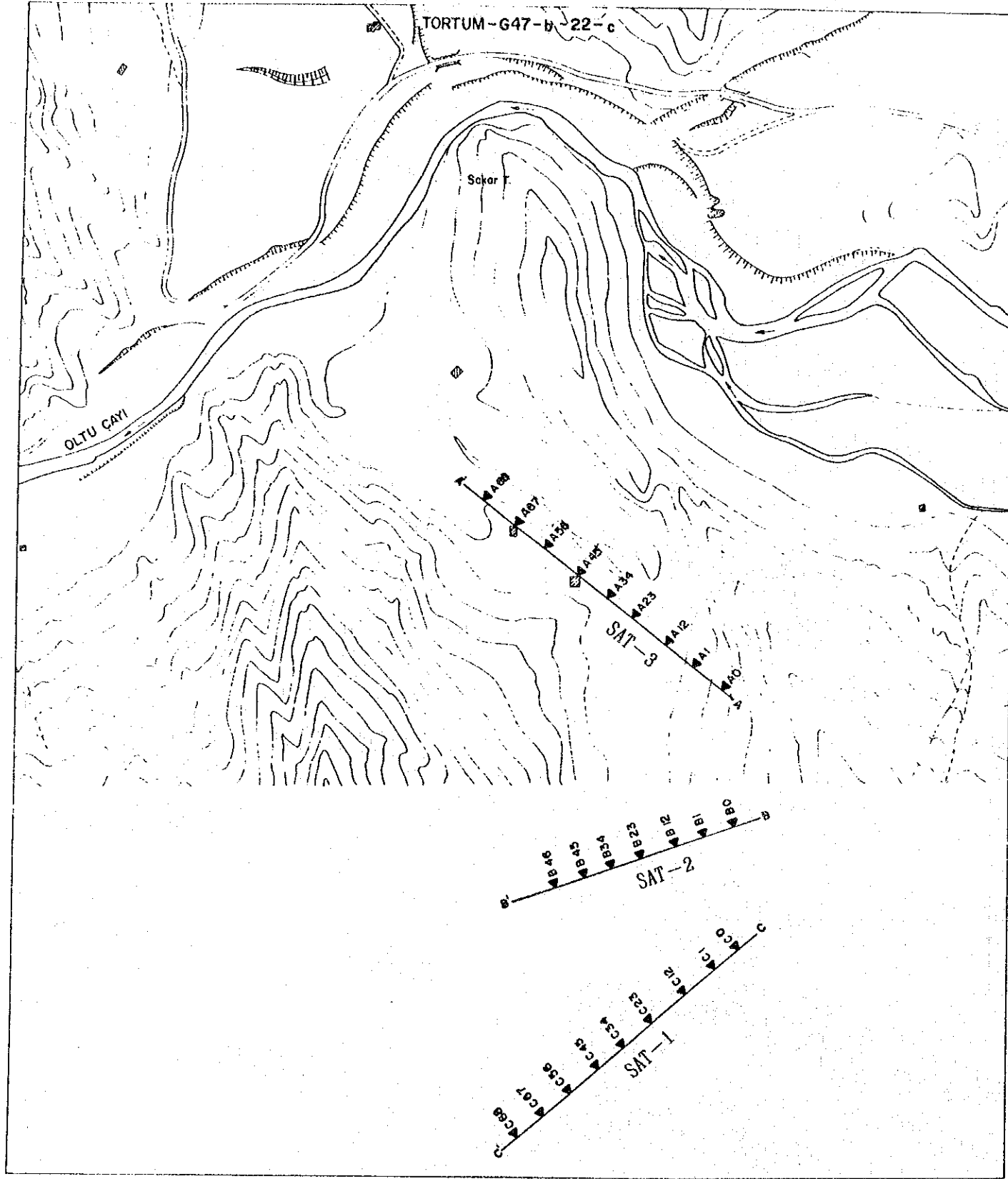
② HEYELAN MALZEMESİ  
LANDSLIDE MATERIAL

③ TABANKAYA (AYVALI VOLKANİTLERİ)  
BEDROCK (AYVALI VOLCANICS)

YATAY ÖLÇEK 1/1000  
HORIZONTAL SCALE



ELEKTRİK İŞLERİ ETÜT İDARESİ GENEL MÜDÜRLÜĞÜ GENERAL DIRECTORATE OF ELECTRICAL POWER RESOURCES SURVEY AND DEVELOPMENT ADMINISTRATION	
ÇORUH-OLTU KOLU OLUR BARAJ ve HES PROJESİ BAHÇECİK HEYELANI JEOFİZİK KESİTİ BAHÇECİK LANDSLIDE	
YAPAN DESIGNED BY : N. SARAÇ H. GÖRMÜŞ	DAİRE BAŞKANI HEAD OF DEPART
ÇİZEN DRAWN BY : ÖZKAR ACAR	
KONTROL CHECKED : <i>[Signature]</i>	GENEL MÜDÜR GENERAL DIRECTOR
SUBE MD. CHIEF OF DIVISION : <i>[Signature]</i>	
No. No. : 24.8.1982	ÖLÇEK SCALE : 1/1000
	Ek : 5



**AÇIKLAMA - EXPLANATION**

- A—A' SİSMİK PROFİL  
 SEISMIC PROFILE  
 AIZ SİSMİK ATIS NOKTASI  
 SHOT POINT

NOT = TORTUM-G47-c-02-b numaralı 1/5000 ölçekli harita EİE arşivlerinde olmadığı için BB' ve CC' sismik profilleri harita üzerine çizilememiştir.

NOTE = TORTUM-G47-c-02-b (scale 1/5000) is not available at EIE therefore BB' and CC' profiles could not be placed on the map.

ELEKTRİK İŞLERİ ETÜT İDARESİ GENEL MÜDÜRLÜĞÜ GENERAL DIRECTORATE OF ELECTRICAL POWER RESOURCES SURVEY AND DEVELOPMENT ADMINISTRATION			
ÇORUH-OLTU KOLU AYVALI BARAJ VE HES PROJESİ TÜNEL GÜZERGAHI JEOFİZİK ÇALIŞMA LOKASYON HARİTASI OLTU-AYVALI HPP PROJECT GEOPHYSICAL SURVEY LOCATION MAP FOR TUNNEL ROUTE			
YAPAN DESIGNED BY : N. SARAC	Ö TEKELİ S. ERTAN	DAİRE BAŞKANI HEAD OF DEPART. <i>[Signature]</i>	
ÇİZEN DRAWN BY : Sibel GÖÇER			
KONTROL CHECKED : <i>[Signature]</i>	GENEL MÜDÜR GENERAL DIRECTOR <i>[Signature]</i>		
SÜBE MD. CHIEF OF DIVISION : <i>[Signature]</i>			
No. No	ÖLÇEK SCALE 1 / 5000		EK App 1
Tarih Date : 19.9.1991			

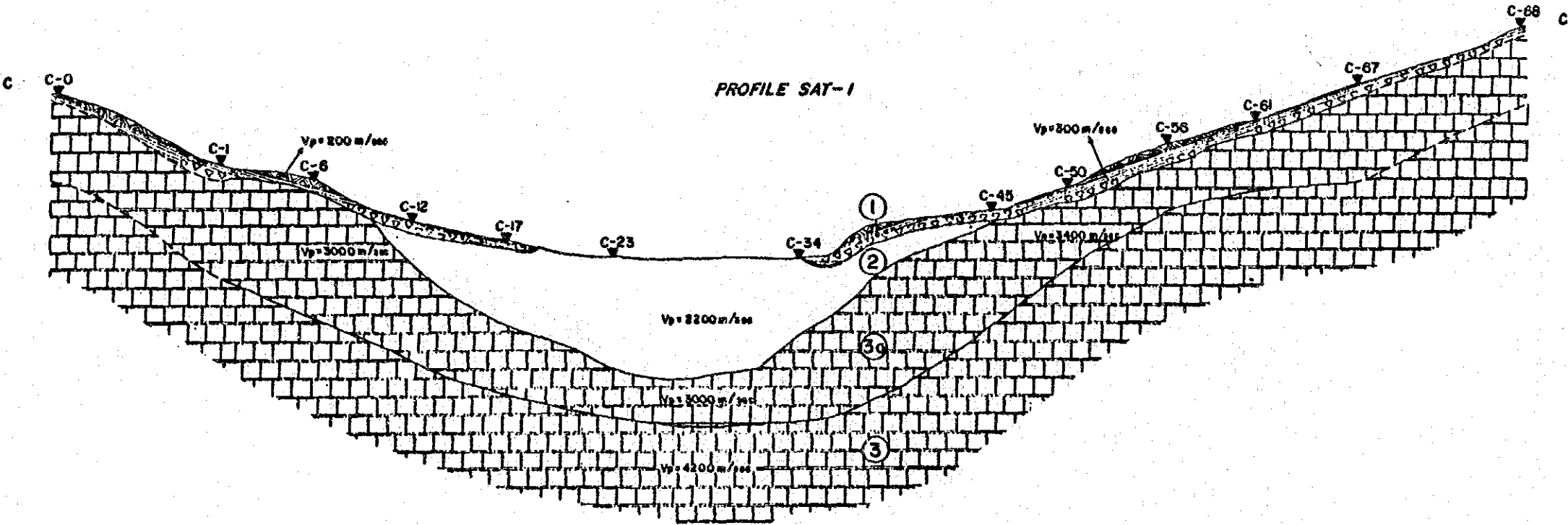
YONSELTI - ELEVATION (m)

830  
820  
810  
780  
770  
750

NE

SW

PROFILE SAT-1



YATAY ÖLÇEK  
HORIZONTAL SCALE

0 10 20 30 40 m

C-1

Vp = 2200 m/sec

①

②

③a

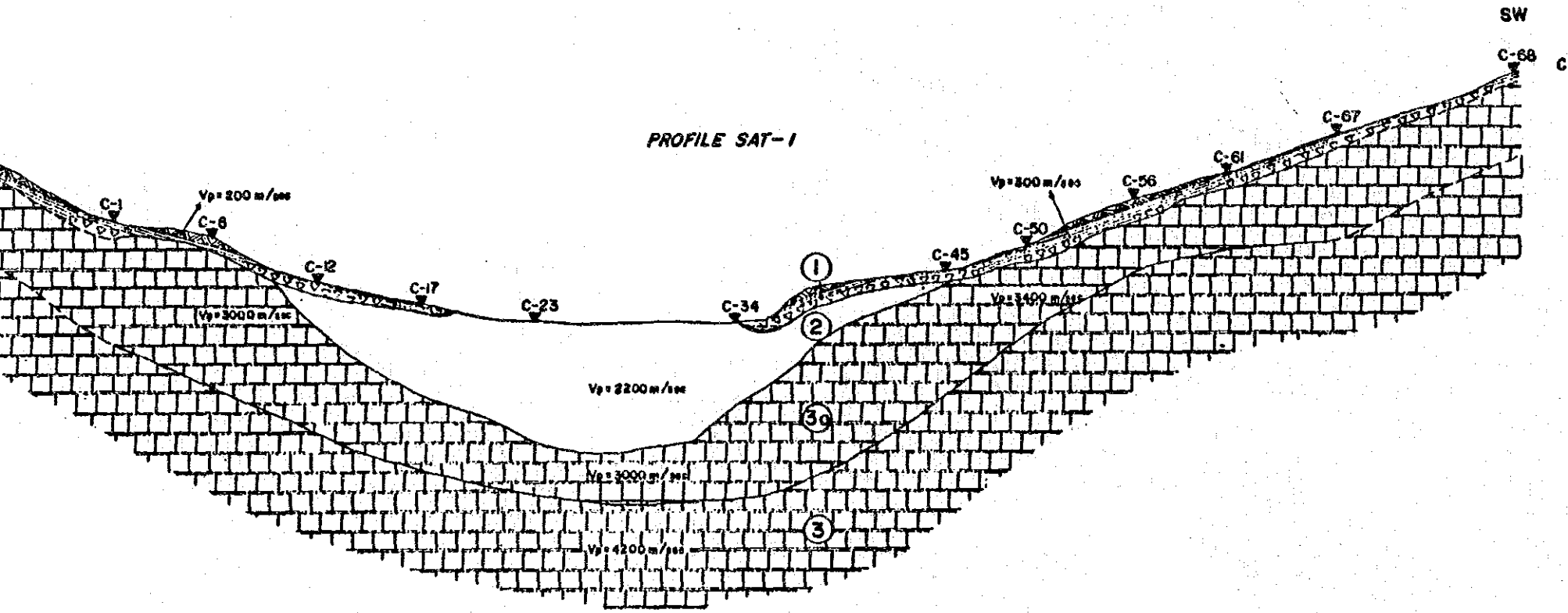
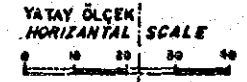
③

ELEKTRİK	GENERAL
SURVEILLANCE	SURVEILLANCE
CORUH-C	
TÜNE	
CORUH	
GEOPHYS	
DESIGNED BY	: N. SARU
DRAWN BY	: S. SARU
CHECKED BY	: U. SARU
CHIEF OF DIVIS	: SARU
No.	:
Date	: 4. 8. 1991

PROF 772







**AÇIKLAMA - EXPLANATION**

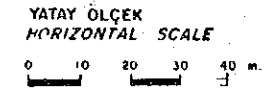
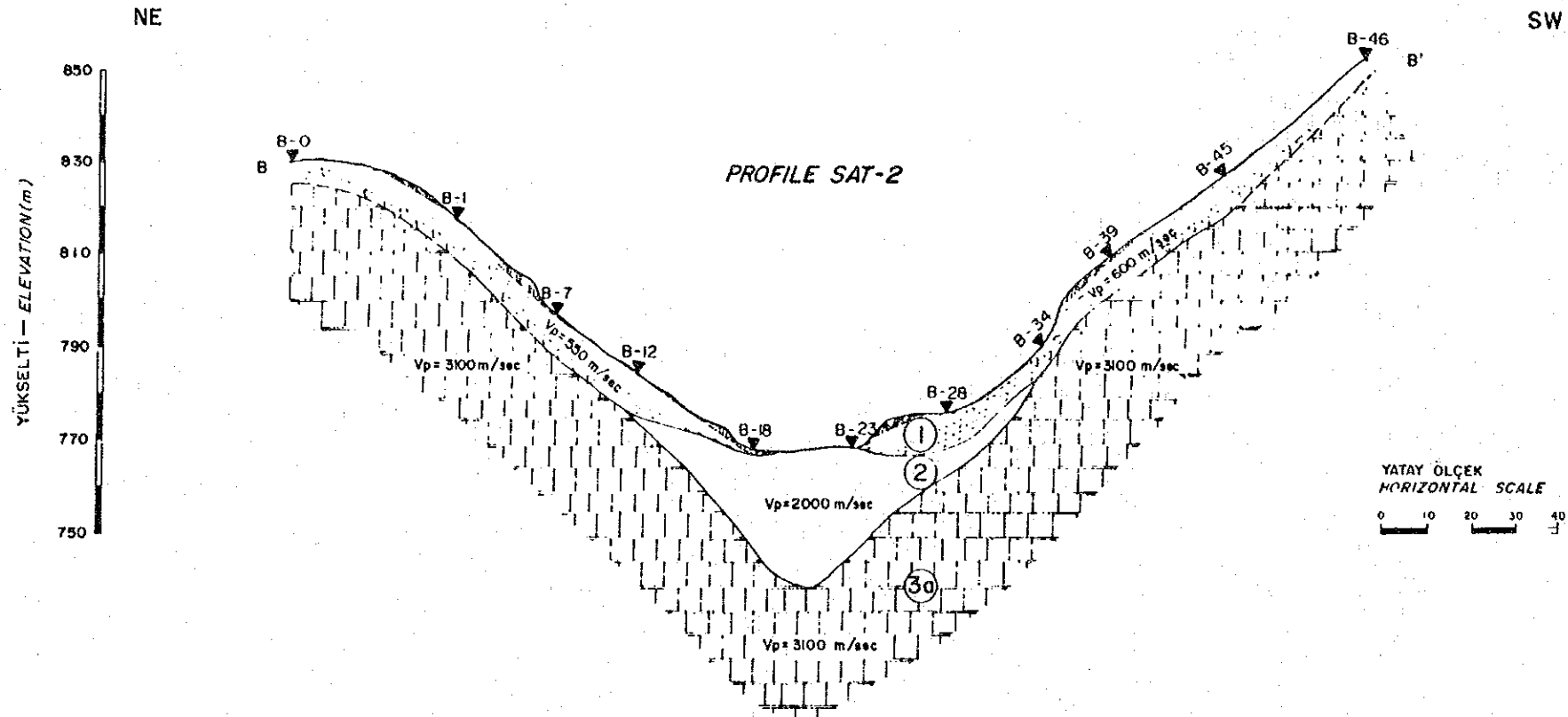
- C-1 SİSMİK ATIŞ NOKTASI  
SHOT POINT
- Vp=2200 m/sec BOYUNA DALGA HIZI  
LONGITUDINAL WAVE VELOCITY
- OLASI TABAKA SINIRI  
PROBABLE CONTACT
- ① BİTKİSEL TOPRAK + ALÜVYON  
AGRICULTURAL SOIL + ALLUVIUM
- ② ALÜVYON  
ALLUVIUM
- ③a TABANKAYA (Pügy Formasyonu)  
BEDROCK (Pügy Formation)
- ③ TABANKAYA (Pügy Formasyonu)  
BEDROCK (Pügy Formation)

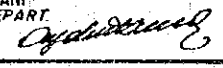
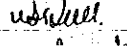
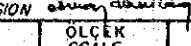


ELEKTRİK İŞLERİ ETÜT İDARESİ GENEL MÜDÜRLÜĞÜ GENERAL DIRECTORATE OF ELECTRICAL POWER RESOURCES SURVEY AND DEVELOPMENT ADMINISTRATION			
ÇORUH-OLTU KOLU AYVALI BARAJ VE HES PROJESİ TÜNEL GÜZERGAHI JEOFİZİK KESİTİ ÇORUH-OLTU-AYVALI HPP PROJECT GEOPHYSICAL SECTIONS AT TUNNEL ROUTE			
YAPAN DESIGNED BY : N. SARAC	Ö. TEKELİ S. ERTAN	DAİRE BAŞKANI HEAD OF DEPART.	<i>[Signature]</i>
ÇİZEN DRAWN BY : S.B. GÖÇER		GENEL MÜDÜR GENERAL DIRECTOR	<i>[Signature]</i>
KONTROL CHECKED BY : <i>[Signature]</i>			
SUBEMAL CHLOF DIVIS : <i>[Signature]</i>			
No. : Date : 4.8.1994	ÖLÇEK SCALE : 1/1000		Es App : 4

**ACIKLAMA - EXPLANATION**

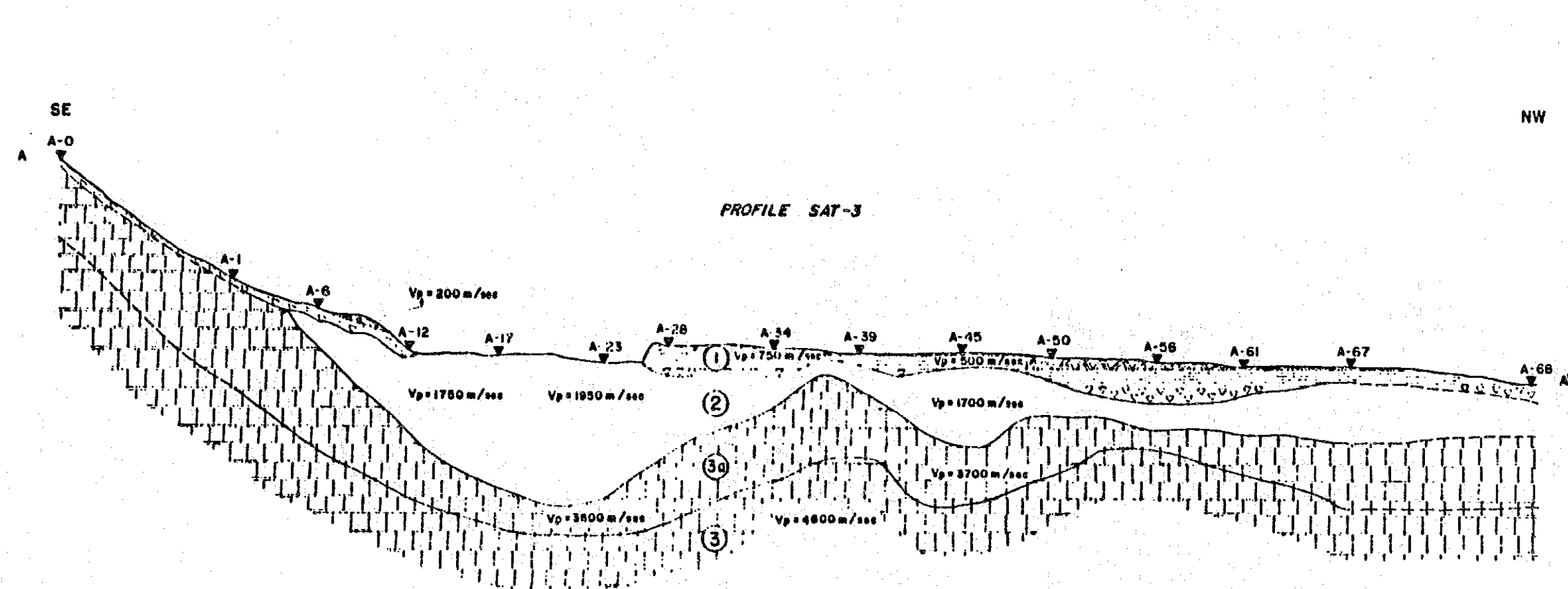
- B-12  SISMİK ATIŞ NOKTASI  
SHOT POINT
- Vp=2000 m/sec  BOYUNA DALGA HIZI  
LONGITUDINAL WAVE VELOCITY
-  OLASI TABAKA SINIRI  
PROBABLE CONTACT
-  ① BİTKİSEL TOPRAK + ALÜVYON  
AGRICULTURAL SOIL + ALLUVIUM
-  ② ALÜVYON  
ALLUVIUM
-  ③a TABANKAYA (Pügye Formasyonu)  
BEDROCK (Pügye Formation)



ELEKTRİK İŞLERİ ETÜT İDARESİ GENEL MÜDÜRLÜĞÜ GENERAL DIRECTORATE OF ELECTRICAL POWER RESOURCES SURVEY AND DEVELOPMENT ADMINISTRATION			
ÇORUH-OLTU KOLU AYVALI BARAJ VE HES PROJESİ TÜNEL GÜZERGAHI JEOPİZİK KESİTİ ÇORUH-OLTU-AYVALI HES PROJECT GEOPHYSICAL SECTIONS AT TUNNEL ROUTE			
YAPAN DESIGNED BY	N. SARAÇ	O. TEKELİ	DAİRE BAŞKANI HEAD OF DEPART.
ÇİZEN DRAWN BY	Sibel GÖÇER		
KONTROL CHECKED			
SÜBİ MÜD. CHIEF OF DIVISION			GENEL MÜDÜR Y. GENERAL DIRECTOR
No	OLÇEK SCALE		Ek App
Tarih Date	28.8.1991	1 / 1000	3



YONSELTİ - ELEVATION (m)



YATAY ÖLÇEK  
HORIZONTAL SCALE  
0 10 20 30 40 m

- A-6  
▽  
Vp = 4800 m/sec
- ①
- ②
- ③
- ③

ELEKT GENERA
ÇORUM
TÜ CO. GEOPH
DESIGNED BY : N.S
DRAWN BY : GIB
CONTROL CHECKED BY : U.L
SUBE MD CH. OF DIVIS : OR
No
23.8 1991

26/11/91

**AÇIKLAMA - EXPLANATION**

A-6 SİSMİK ATIŞ NOKTASI  
SHOT POINT

Vp=4800 m/sec BOYLUNA DALGA HIZI  
LONGITUDINAL WAVE VELOCITY

OLASI TABAKA SINIRI  
PROBABLE CONTACT

① BİTKİSEL TOPRAK + ALÜVYON  
AGRICULTURAL SOIL + ALLUVIUM

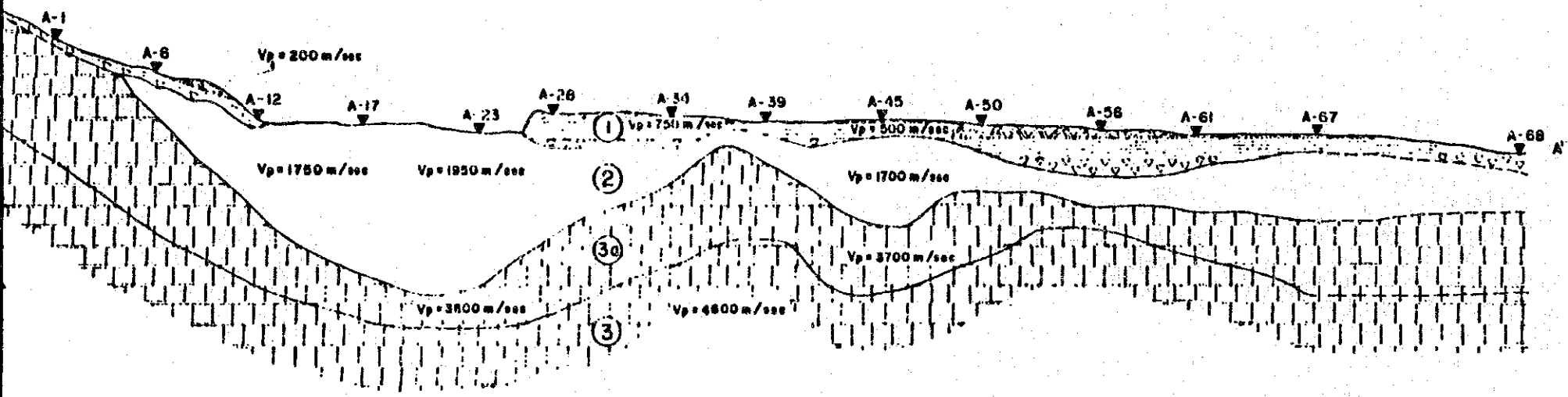
② ALÜVYON  
ALLUVIUM

③ TABANKAYA (Pügy Formasyonu)  
BEDROCK (Pügy Formation)

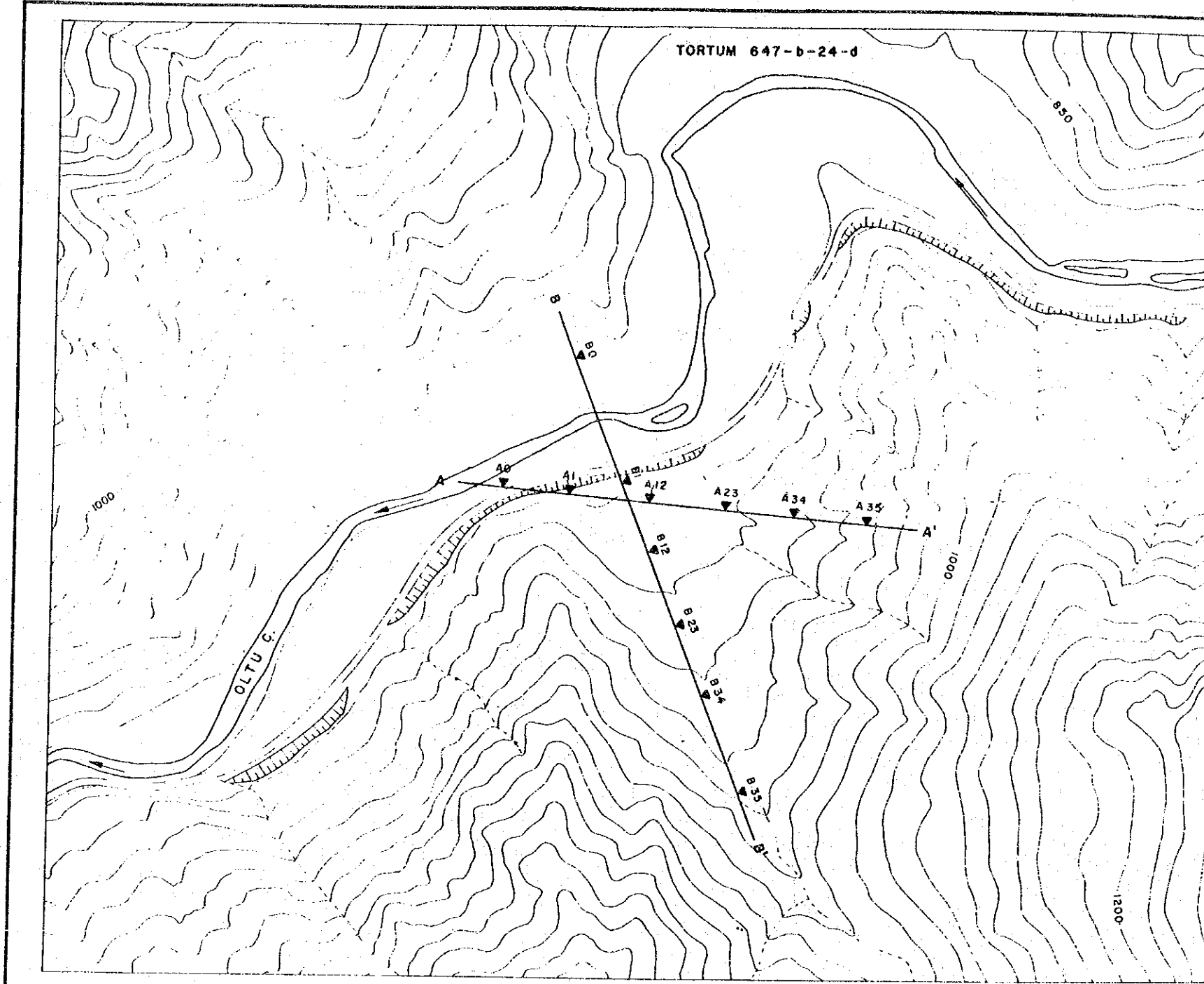
③ TABANKAYA (Pügy Formasyonu)  
BEDROCK (Pügy Formation)

YATAY ÖLÇEK  
HORIZONTAL SCALE  
0 10 20 30 40 m

**PROFILE SAT-3**



ELEKTRİK İŞLERİ ETÜD İDARESİ GENEL MÜDÜRLÜĞÜ GENERAL DIRECTORATE OF ELECTRICAL POWER RESOURCES SURVEY AND DEVELOPMENT ADMINISTRATION			
ÇORUH-ÖLTÜ KOLU AYVALI BARAJ VE HES PROJESİ TÜNEL GÜZERGAHI JEOFİZİK KESİTİ ÇORUH-ÖLTÜ-AYVALI HES PROJECT GEOPHYSICAL SECTIONS AT TUNNEL ROUTE			
YAPAN DESIGNED BY : N. SARAÇ ÇİZEN DRAWN BY : Eibel GÖÇER KONTROL CHECKED BY : ufuell SÜBE MD CH. OF DIVIS : emman-çankaya	DAİRE BAŞKANI HEAD OF DEPART. <i>[Signature]</i> GENEL MÜDÜR GENERAL DIRECTOR <i>[Signature]</i>	No : ÖLÇEK SCALE 1 / 1000	Ek App : 2
Tarih Date : 23.6.1991			



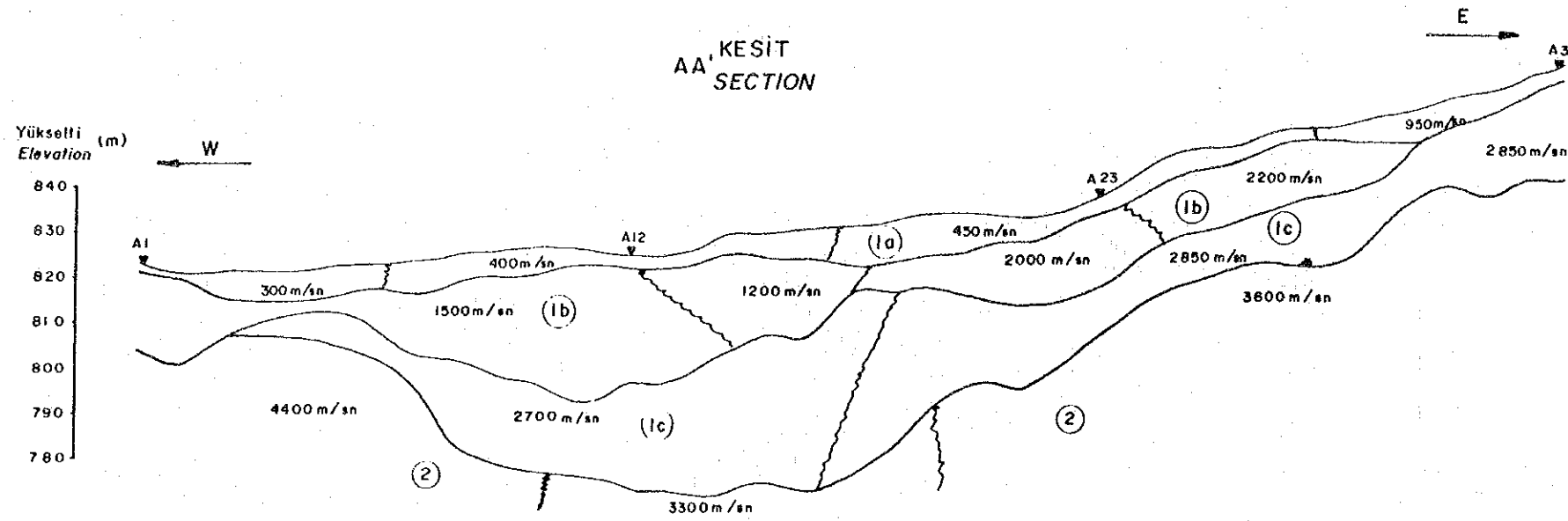
**AÇIKLAMA - EXPLANATION**

A — A' SİSMİK PROFİL  
SEISMIC PROFILE

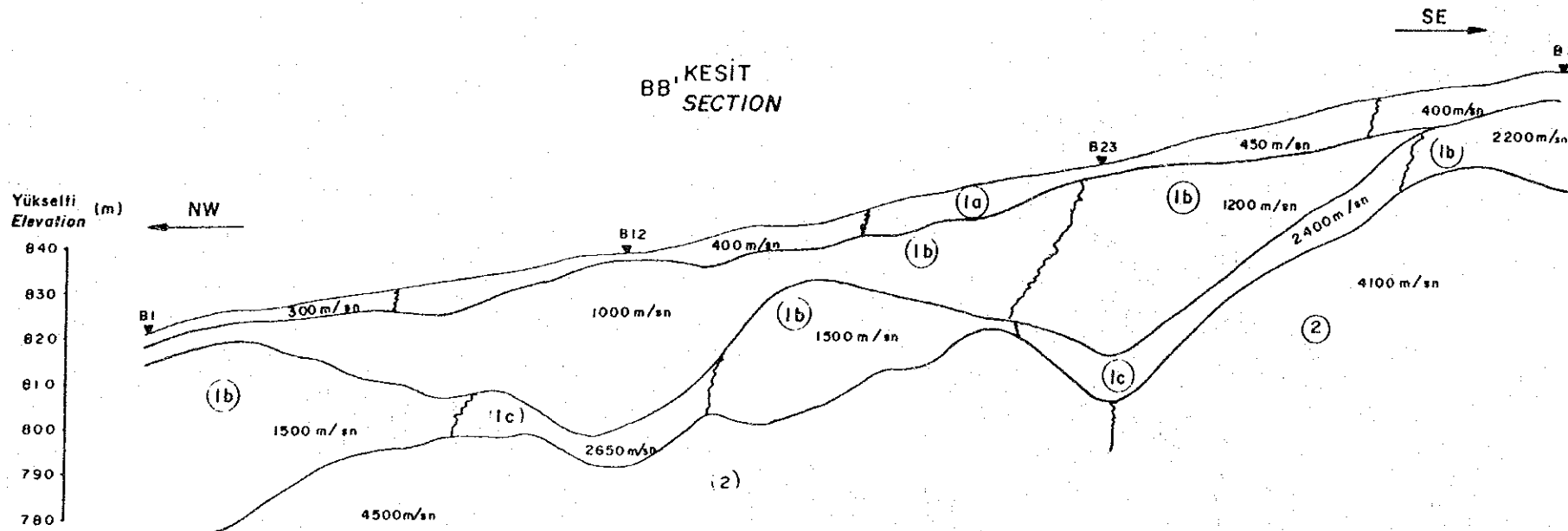
BI SİSMİK ATIS NOKTASI  
SEISMIC SHOT POINT

ELEKTRİK İŞLERİ ETÜT İDARESİ GENEL MÜDÜRLÜĞÜ GENERAL DIRECTORATE OF ELECTRICAL POWER RESOURCES SURVEY AND DEVELOPMENT ADMINISTRATION	
CORUH - OLTU KOLU AYVALI BARAJ VE HES PROJESİ YAKLAŞIM TUNELİ SAHASI JEOFİZİK ÇALIŞMA LOKASYON HARİTASI CORUH - OLTU - AYVALI DAM AND HPP PROJECT GEOPHYSICAL SURVEY LOCATION MAP OF ACCESS TUNNEL SITE	
YAPAN DESIGNED BY: H. SARAC, F. ÇAKAN O. TEKELİ	DAİRE BAŞKANI HEAD OF DEPART <i>[Signature]</i>
ÇİZEN DRAWN BY: BİRSEN ÖZDAR	<i>[Signature]</i>
KONTROL CHECKED: <i>[Signature]</i>	<i>[Signature]</i>
SÜBE MD. CHI OF DIVIS: <i>[Signature]</i>	GENEL MÜDÜR GENERAL DIRECTOR
NO	ÖLÇEK SCALE
Tarih Date: 17/3/1992	1/5000
	EK App: 1

AA' KESİT  
SECTION



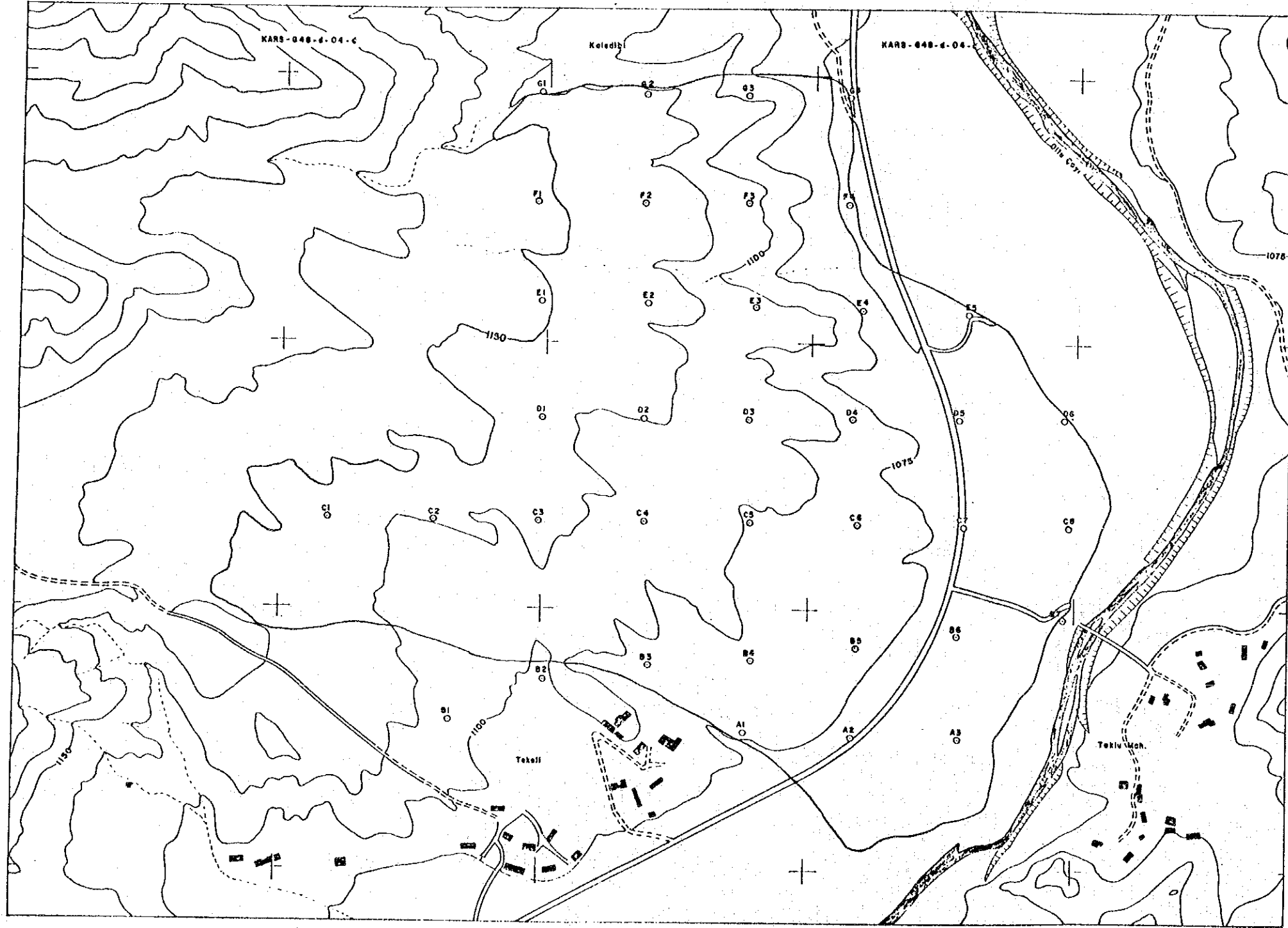
BB' KESİT  
SECTION



AÇIKLAMALAR — EXPLANATION

- ▲ A1 SİSMİK ATIŞ NOKTASI  
SHOT POINT
- 950 m/sn BOYUNA DALGA HIZI  
LONGITUDINAL WAVE VELOCITY
- (a) (b) (c) DEPOZİT MALZEME  
DEPOSIT MATERIAL
- (2) TABANKAYA (AYVALI VOLKANİTLERİ)  
BEDROCK (AYVALI VOLCANICS)

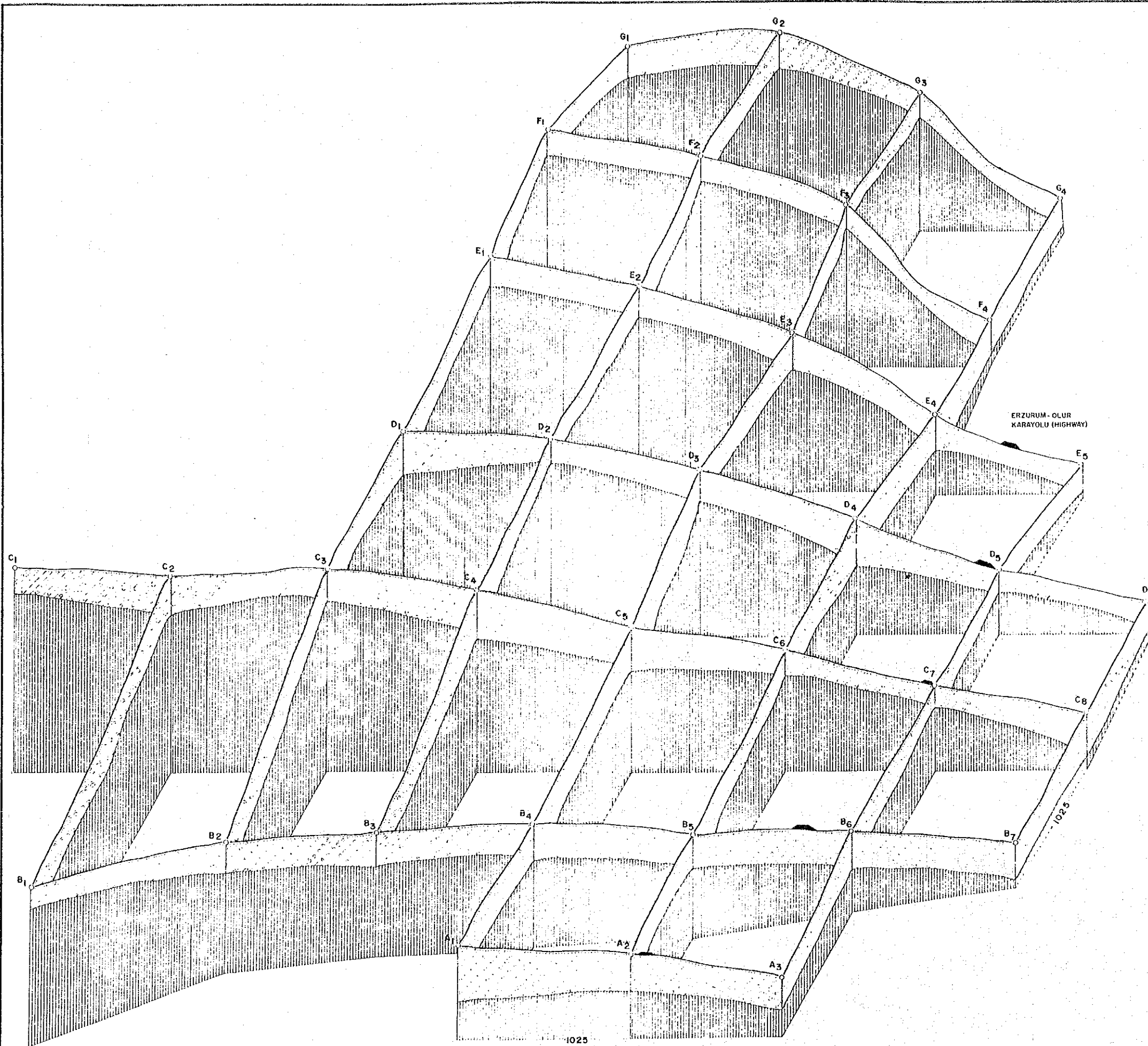
ELEKTRİK İŞLERİ ETÜT İDARESİ GENEL MÜDÜRLÜĞÜ GENERAL DIRECTORATE OF ELECTRICAL POWER RESOURCES SURVEY AND DEVELOPMENT ADMINISTRATION			
ÇORUH-OLTU KOLU AYVALI BARAJ ve HES PROJESİ YAKLAŞIM TUNELİ SAHASI JEOFİZİK KESİTLERİ ÇORUH-OLTU-AYVALI DAM AND HPP PROJECT GEOPHYSICAL SECTION OF ACCESS TUNNEL SITE			
YAPAN DESIGNED BY : N.SARAC, F. CAKAN ÖTEKELİ	DAİRE BAŞKANI HEAD OF DEPT		
ÇİZEN DRAWN BY : Halice ALTIN	[Signature]		
KONTROL CHECKED BY : [Signature]	[Signature]		
SÜBE MD CHI OF DIVIS : [Signature]	GENEL MÜDÜR GENERAL DIRECTOR		
No No	ÖLÇEK SCALE		EK App : 2
Tarih Date	16 / 3 / 1992	1 / 1000	








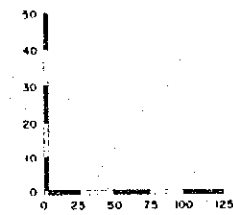
**AÇIKLAMA - EXPLANATION**

A1  
○ DÜSEY ELEKTRİK SONDAJ  
VERTICAL ELECTRICAL SOUNDING

ELEKTRİK İŞLERİ ETÜT İDARESİ GENEL MÜDÜRLÜĞÜ GENERAL DIRECTORATE OF ELECTRICAL POWER RESOURCES SURVEY AND DEVELOPMENT ADMINISTRATION			
ÇORUH-OLTU KOLU OLUR BARAJ VE HES PROJESİ TEKELİ (KALEDİBİ) MALZEME SAHASI JEOFİZİK ÇALIŞMA LOKASYON HARİTASI OLTU-OLUR HPP PROJECT GEOPHYSICAL SURVEY LOCATION MAP FOR TEKELİ (KALEDİBİ) BORROW AREA			
YAPAN DESIGNED BY: Necati SAHAÇ	DAİRE BAŞKANI HEAD OF DEPART. <i>[Signature]</i>		
ÇİZEN DRAWN BY: Birsen DÜNDAR	KONTROL CHECKED BY: <i>[Signature]</i>		
ŞUBE MD. CHIEF DIVS: <i>[Signature]</i>	GENEL MÜDÜR GENERAL DIRECTOR <i>[Signature]</i>		
No : Date: 28/1/1992	ÖLÇEK SCALE 1/5000		Ek : 1 App: 1

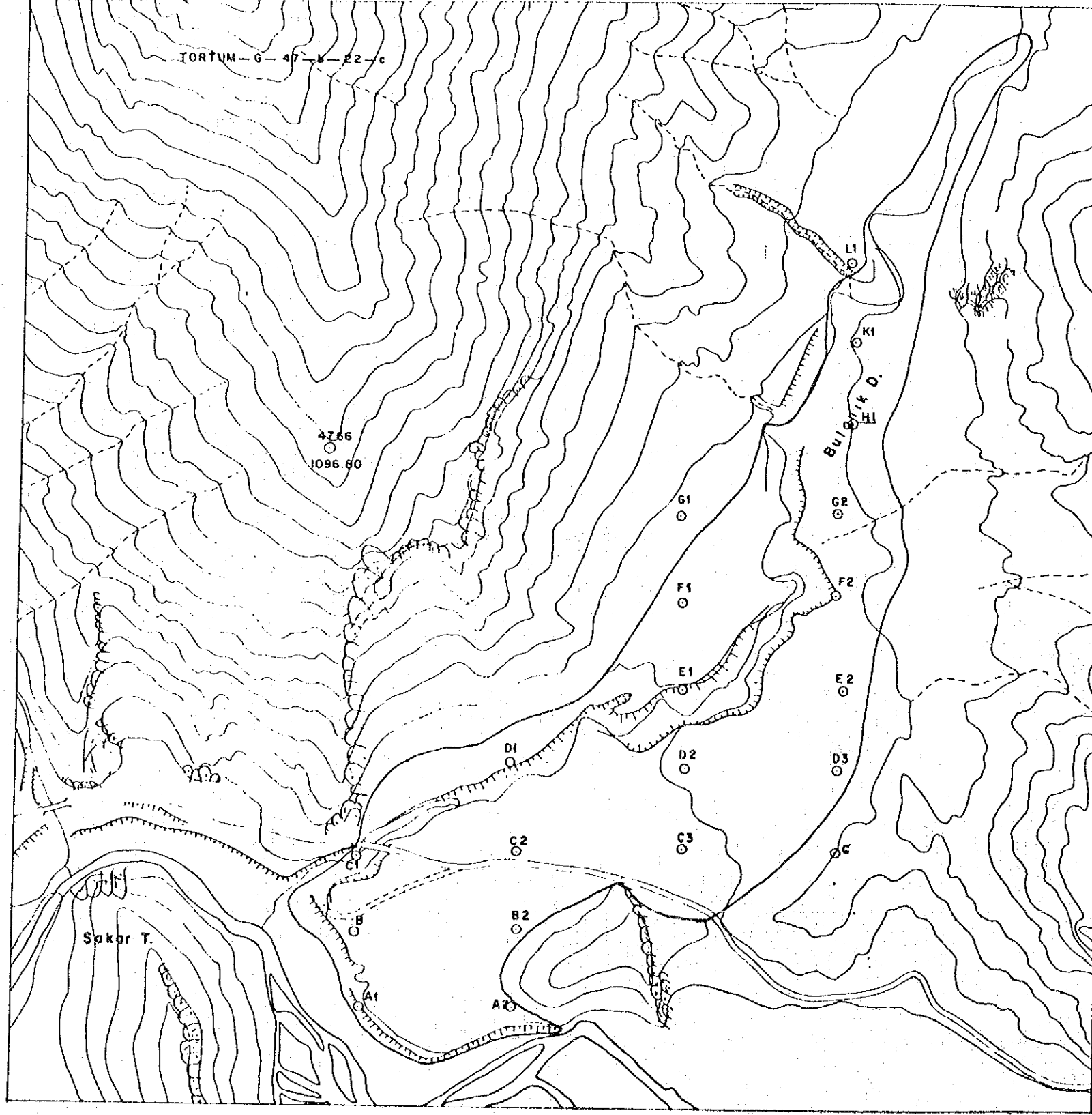


-  BİTKİSEL TOPRAK  
AGRICULTURAL SOIL
-  KÖTÜ DERECELENMİŞ ÇAKIL - KUM - KİL KARİŞİMİ  
POORLY GRADED GRAVEL - SAND - CLAY MIXTURE
-  TABANKAYA  
BEDROCK
-  C1  
DÜŞEY ELEKTRİK SONDAJ  
VERTICAL ELECTRICAL SOUNDING
-  -1025-  
DİYAGRAM TABAN KOTU  
DIAGRAM BASE ELEVATION



YATAY ÖLÇEK : 1/2500  
Horizontal Scale  
DÜŞEY ÖLÇEK : 1/1000  
Vertical Scale

ELEKTRİK İŞLERİ ETÜT İDARESİ GENEL MÜDÜRLÜĞÜ GENERAL DIRECTORATE OF ELECTRICAL POWER RESOURCES SURVEY AND DEVELOPMENT ADMINISTRATION			
ÇORUH - ÖLTÜ KOLU OLUR BARAJ ve HES PROJESİ TEKELİ (KALEDİBİ) MALZEME SAHASI DÜŞEY ELEKTRİK SONDAJLARA GÖRE PANEL DİYAGRAMI PANEL DIAGRAM FOR TEKELİ (KALEDİBİ) BORROW AREA			
YAPAN DESIGNED BY : N. SARAÇ Ö. TEKELİ	DAİRE BAŞKANI HEAD OF DEPART		
CİZEN DRAWN BY : Serhat ARAYANCI	KONTROL CHECKED BY : [Signature]		
SÜBE MD CH. OF DIVIS. : [Signature]	GENEL MÜDÜR GENERAL DIRECTOR : [Signature]		
No. : No. : Tarih : 28.1.1992	ÖLÇEK SCALE	Ex : 2 App :	

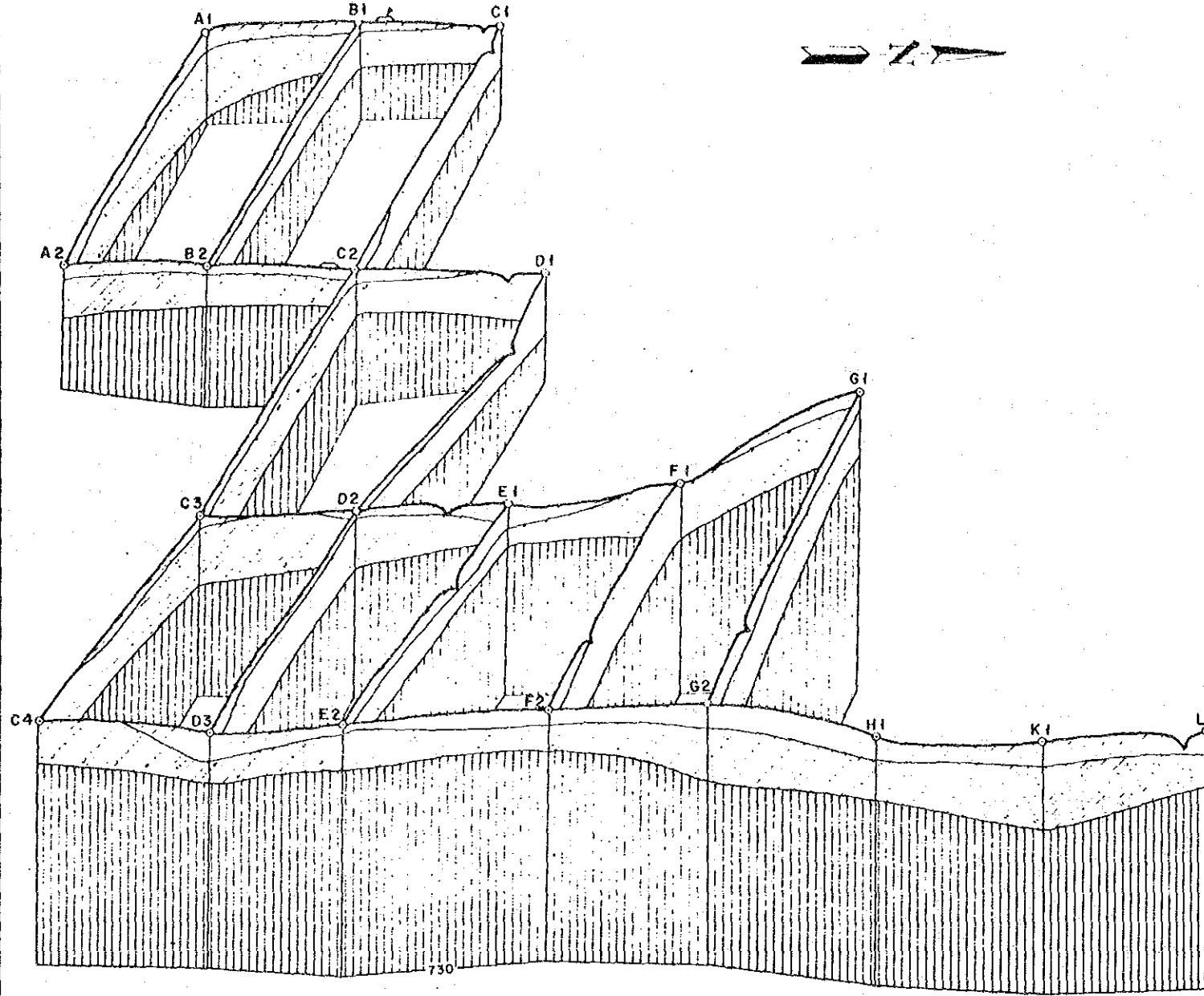


**AÇIKLAMA-EXPLANATION**


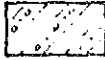



A1  
○ DÜŞEY ELEKTRİK SONDAJ  
VERTICAL ELECTRICAL SOUNDING

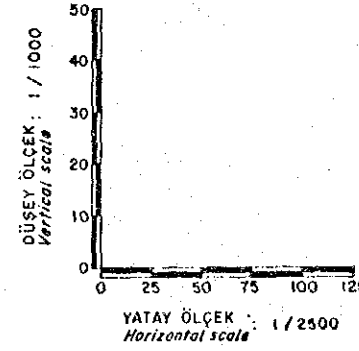
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ÇORUH-OLTU KOLU AYVALI BARAJ VE HES PROJESİ BULANIKDERE MALZEME SAHASI JEOFİZİK ÇALIŞMA LOKASYON HARİTASI OLTU AYVALI HPP PROJECT GEOPHYSICAL SURVEY LOCATION MAP FOR BULANIK VALLEY BORROW AREA			
YAPAN DESIGNED BY : N. SARAĞ Ö TEKELİ		DAİRE BAŞKANI HEAD OF DEPART. :	
ÇİZEN DRAWN BY : HATİCE ALTIN		:	
KONTROL CHECKED BY : <i>u. s. tekel</i>		:	
ŞUBE MD. CHI OF DIVIS. : <i>Emrehan</i>		GENEL MÜDÜR GENERAL DIRECTOR :	
No. No	ÖLÇEK SCALE		EK APP
Tarih Date	27/1/1992	1/5000	1

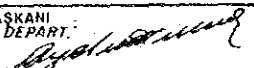
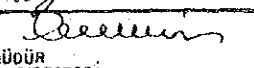
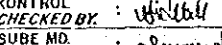
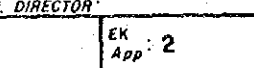
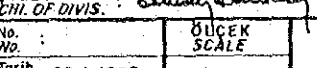
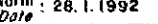

ERZURUM - OLUR KARAYOLU (HIGHWAY)



**AÇIKLAMA - EXPLANATION**

-  DÜŞÜK - ORTA PLASTİSİTELİ ÇAKILLI KİL (İNORGANİK)  
GRAVELLY CLAY (INORGANIC) WITH LOW - MEDIUM PLASTICITY
-  KÖTÜ DERECELENMİŞ ÇAKIL - KUM - KİL KARIŞIMI  
POORLY GRADED GRAVEL - SAND - CLAY MIXTURE
-  TABANKAYA  
BEDROCK
-  A2  
DÜŞEY ELEKTRİK SONDAJ  
VERTICAL ELECTRICAL SOUNDING
-  730  
DİYAGRAM TABAN KOTU  
DIAGRAM BASE ELEVATION

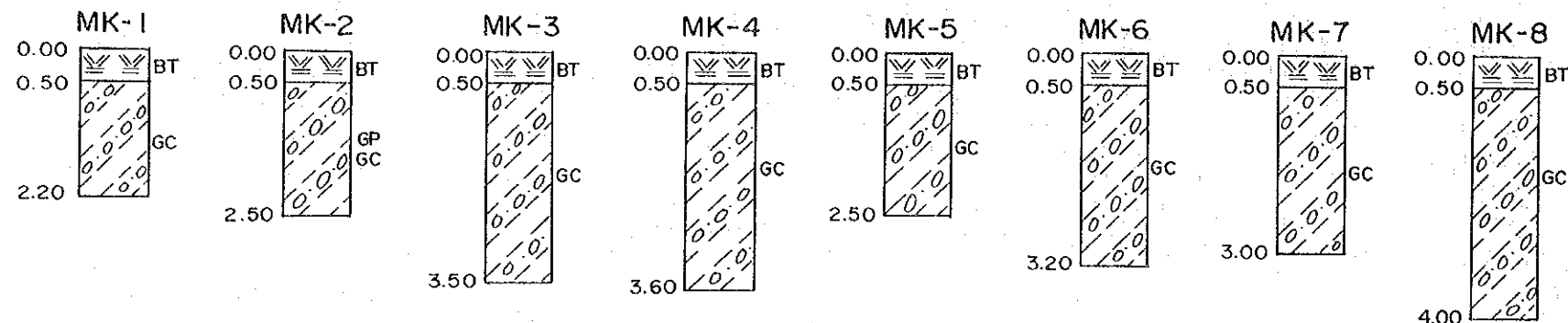


ELEKTRİK İŞLERİ ETÜT İDARESİ GENEL MÜDÜRLÜĞÜ GENERAL DIRECTORATE OF ELECTRICAL POWER RESOURCES SURVEY and DEVELOPMENT ADMINISTRATION	
ÇORUH - OLTU KOLU AYVALI BARAJ ve HES PROJESİ BULANKİDERE MALZEME SAHASI DÜŞEY ELEKTRİK SONDAJLARA GÖRE PANEL DİYAGRAMI PANEL DIAGRAM FOR BULANKİDERE BORROW AREA	
YAPAN DESIGNED BY: N. SARAC O. TEKELİ	DAİRE BAŞKANI HEAD OF DEPART: 
ÇİZEN DRAWN BY: Sinan USER	
KONTROL CHECKED BY: 	GENEL MÜDÜR GENERAL DIRECTOR: 
SUBE NO. CH. OF DIVIS.: 	
No. No.: 	ÖLÇEK SCALE: 
Tarih Date: 28.1.1992	EK App: 2

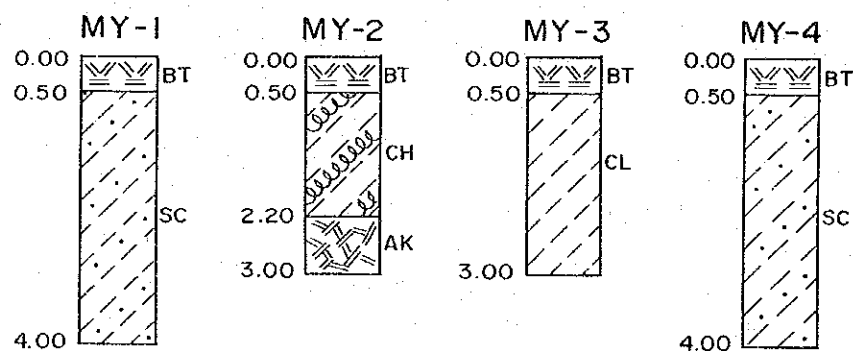


# TEST PIT LOGS OF IMPERVIOUS CORE MATERIAL FOR OLUR DAM AND HPP


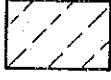
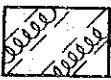
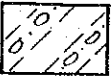



## KALEDİBİ BORROW AREA



## YOLBOYU BORROW AREA



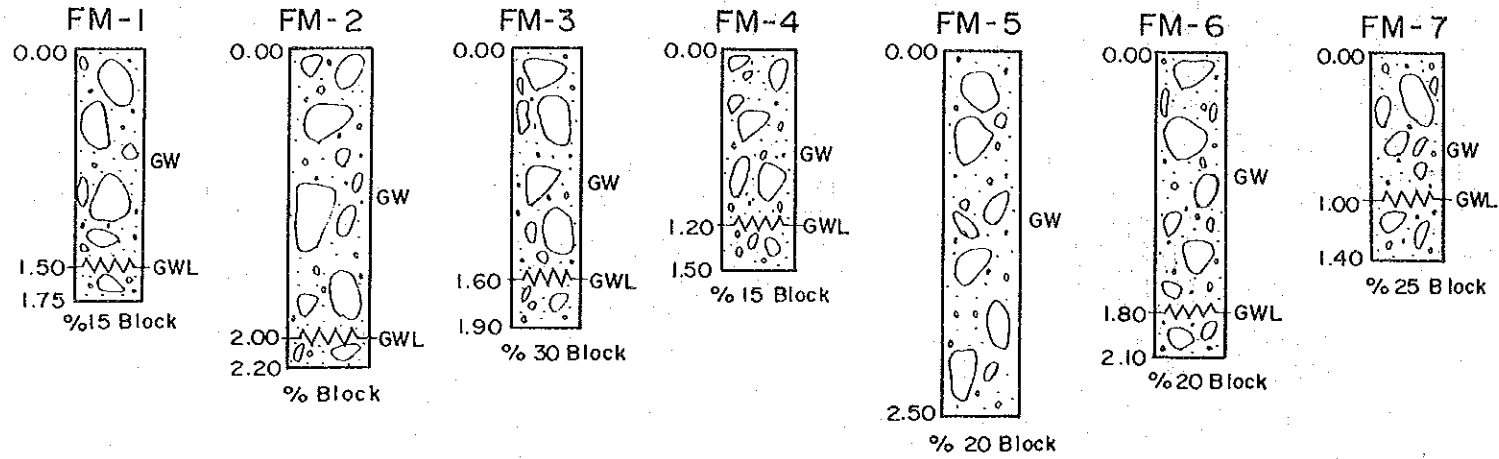
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-  CL GRAVELLY CLAY (INORGANIC) WITH LOW-MEDIUM PLASTICITY
-  CH INORGANIC CLAY WITH HIGH PLASTICITY
-  GC POORLY GRADED GRAVEL-SAND-CLAY MIXTURE
-  SC POORLY GRADED SAND-CLAY MIXTURE
-  GP POORLY GRADED GRAVEL-SAND-CLAY MIXTURE
-  AK BED ROCK


OLTU RIVER HYDROELECTRIC  
POWER DEVELOPMENT PROJECT

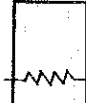
Geological Investigation Work  
OLUR BORROW AREA-PIT  
Kaledibi and Yolboyu

## PROFILES OF PERVIOUS MATERIAL TEST PITS



### LEGEND


GW WELL GRADED GRAVEL - SAND MIXTURES


GWL GROUND WATER LEVEL

OLTU RIVER HYDROELECTRIC  
 POWER DEVELOPMENT PROJECT

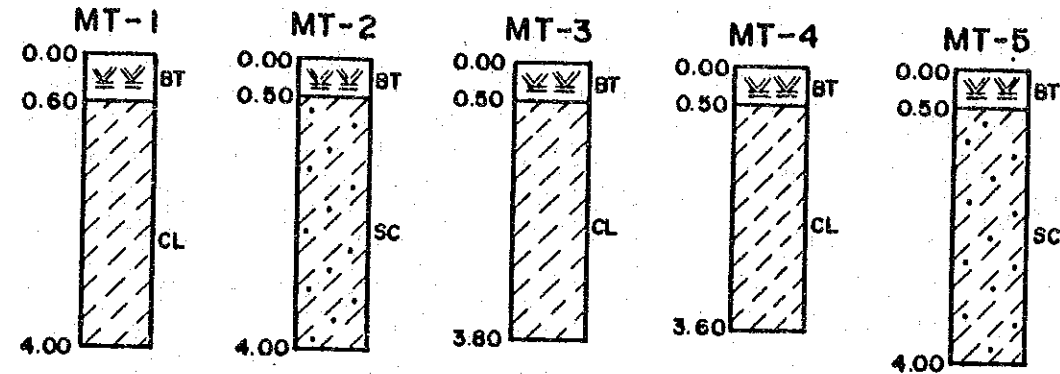
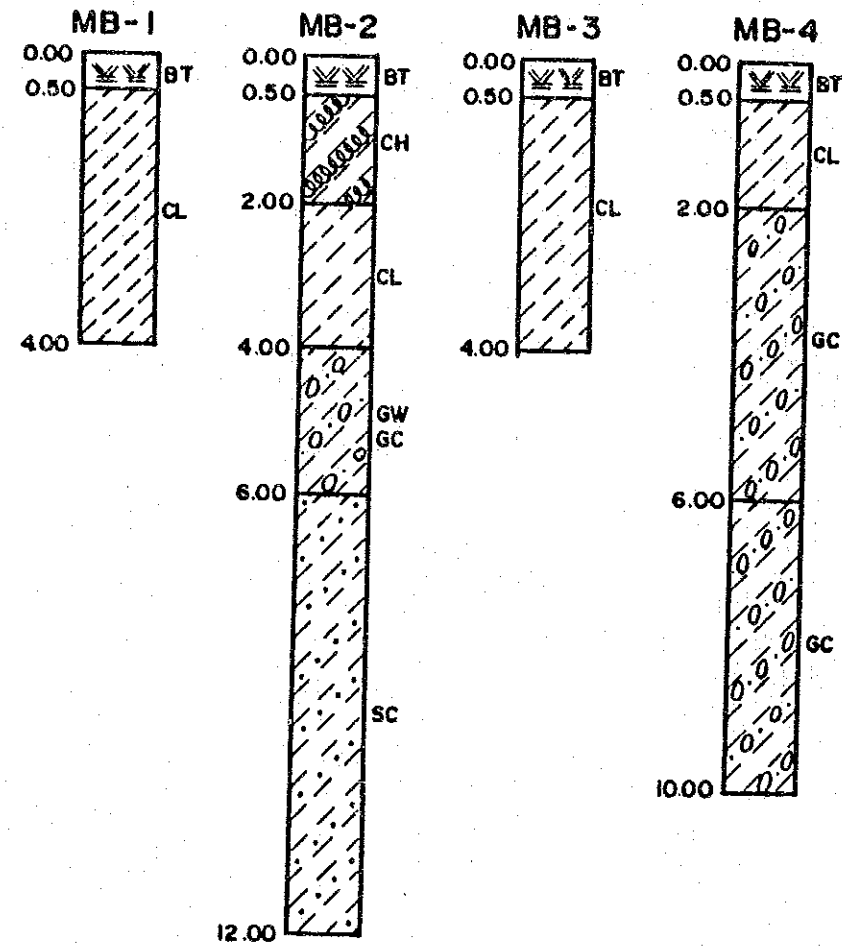
Geological Investigation Work  
 OLUR AGGREGATE - PIT



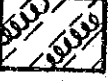
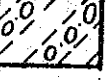
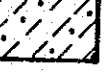
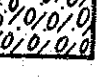
# TEST PIT LOGS OF IMPERVIOUS CORE MATERIAL FOR AYVALI DAM and HPP

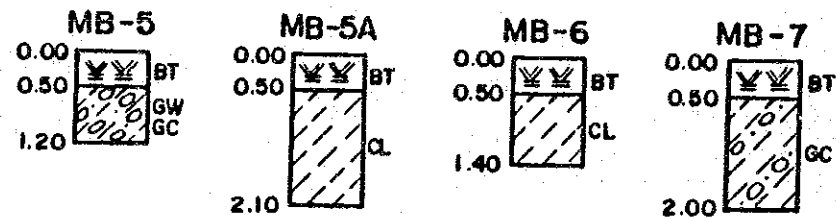
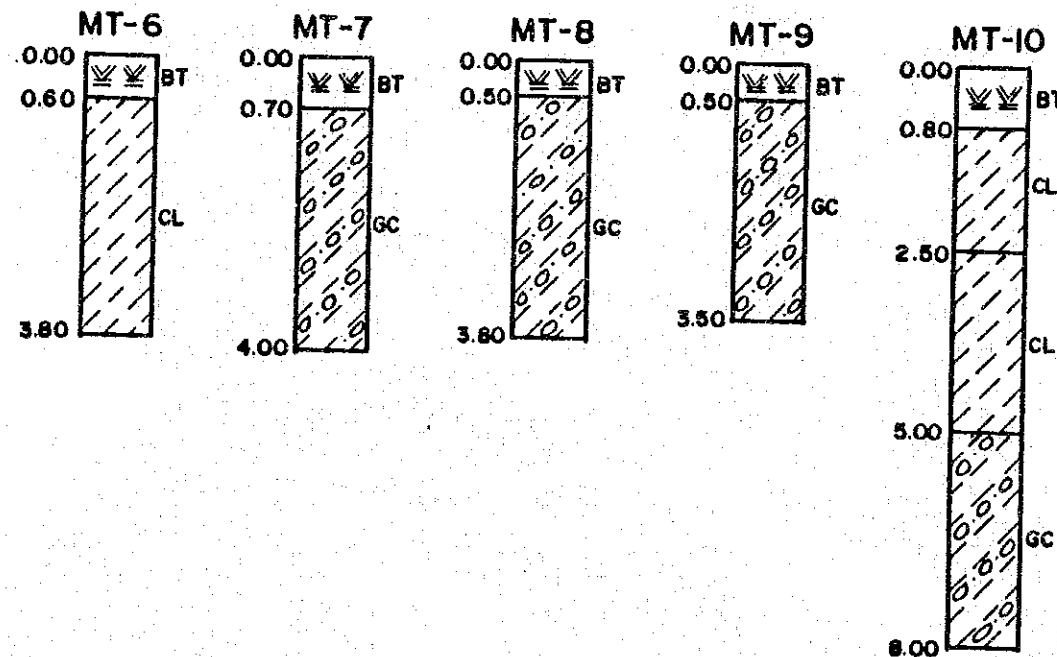
## BULANIK DERE BORROW AREA

## TAVUSKER BORROW AREA

## LEGEND



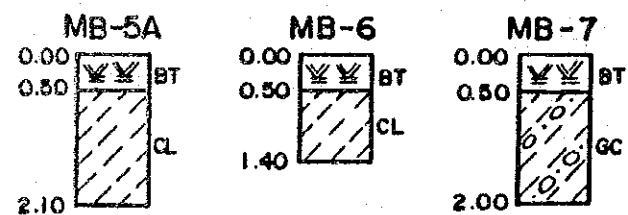
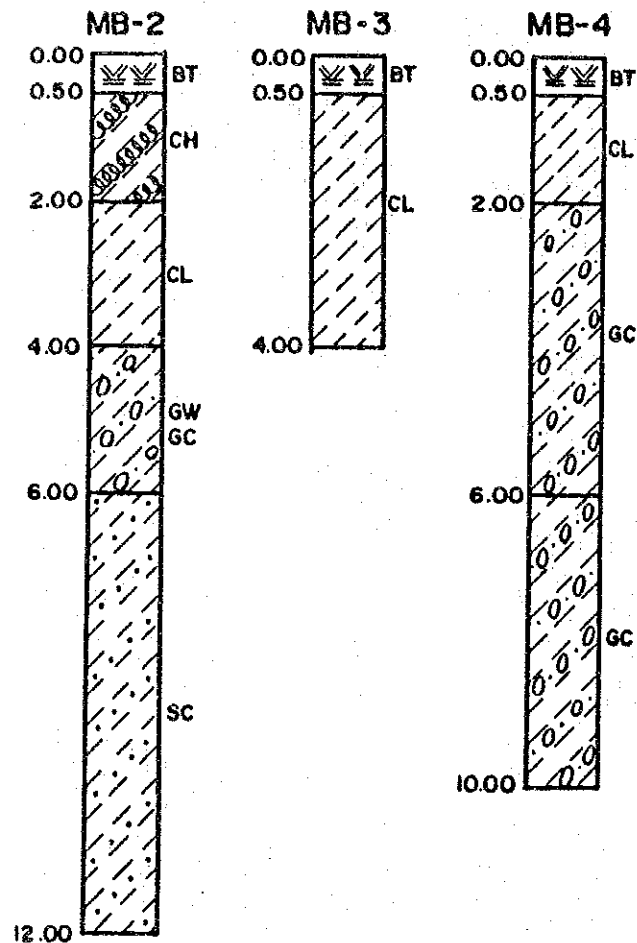
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-  SC POORLY GRADED SAND
-  GW WELL GRADED GRAVEL



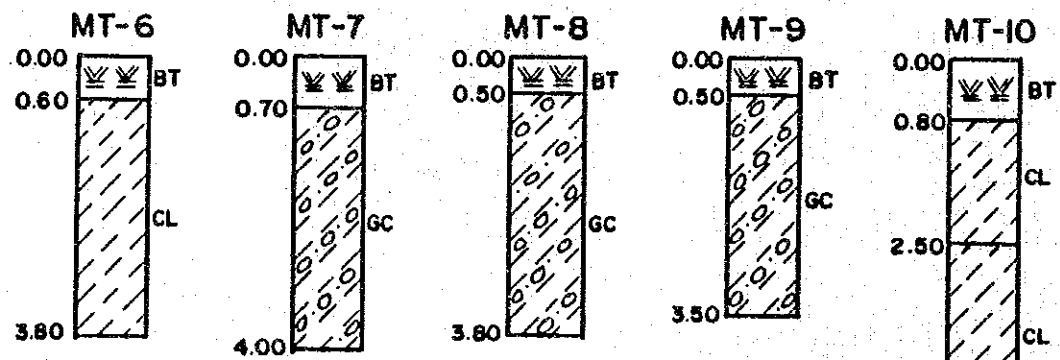
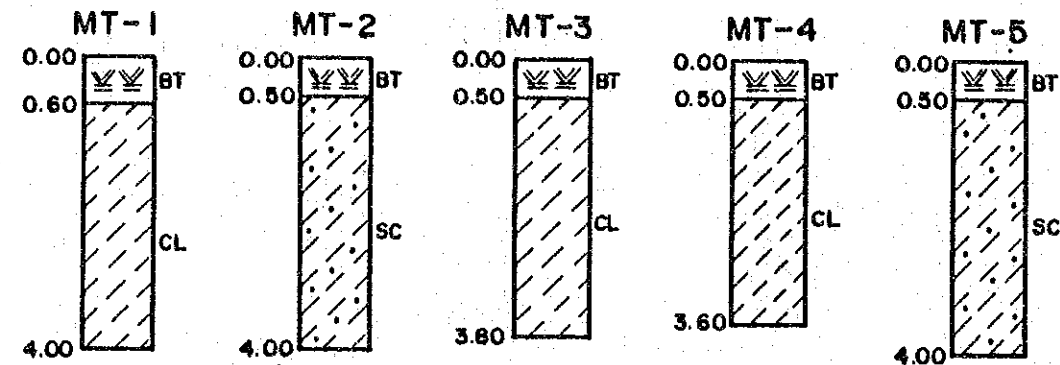
7-10-77

# PIT LOGS OF IMPERVIOUS CORE MATERIAL FOR AYVALI DAM and HPP

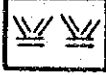


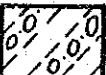
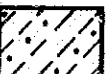
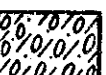
## BULANIK DERE BORROW AREA



## TAVUSKER BORROW AREA



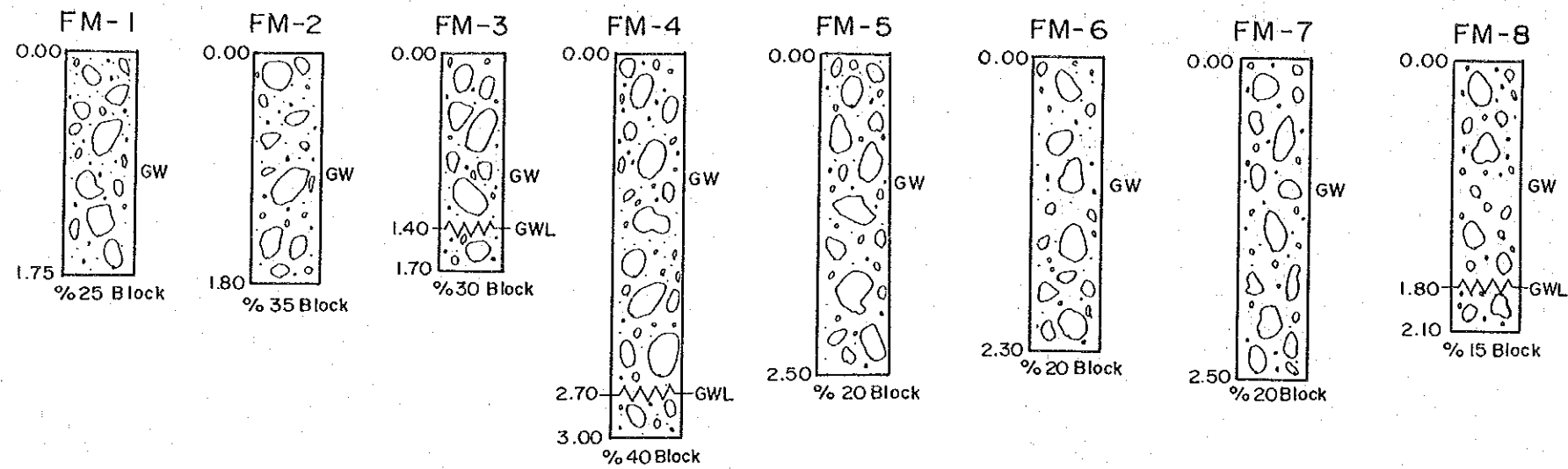
## LEGEND

-  BT TOP SOIL
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-  CH INORGANIC CLAY WITH HIGH PLASTICITY
-  GC POORLY GRADED GRAVEL-SAND-CLAY MIXTURE
-  SC POORLY GRADED SAND-CLAY MIXTURE
-  GW WELL GRADED GRAVEL-SAND MIXTURE

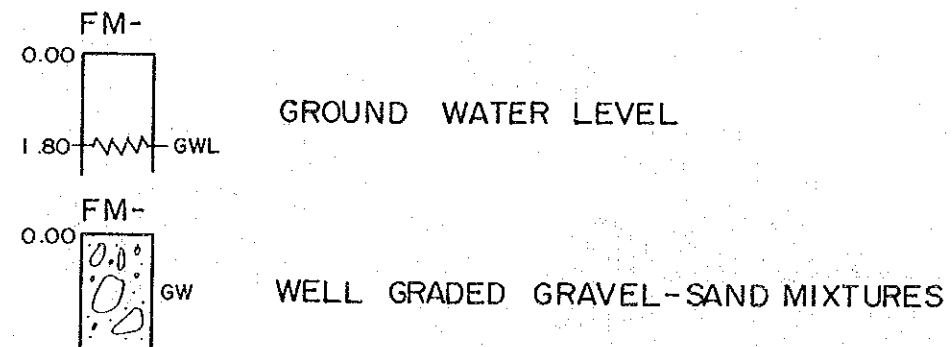
OLTU RIVER HYDROELECTRIC  
 POWER DEVELOPMENT PROJECT

Geological Investigation Work  
 AYVALI BORROW AREA-PIT  
 Bulanik and Tavusker

## PROFILES OF PERVIOUS MATERIAL TEST PITS



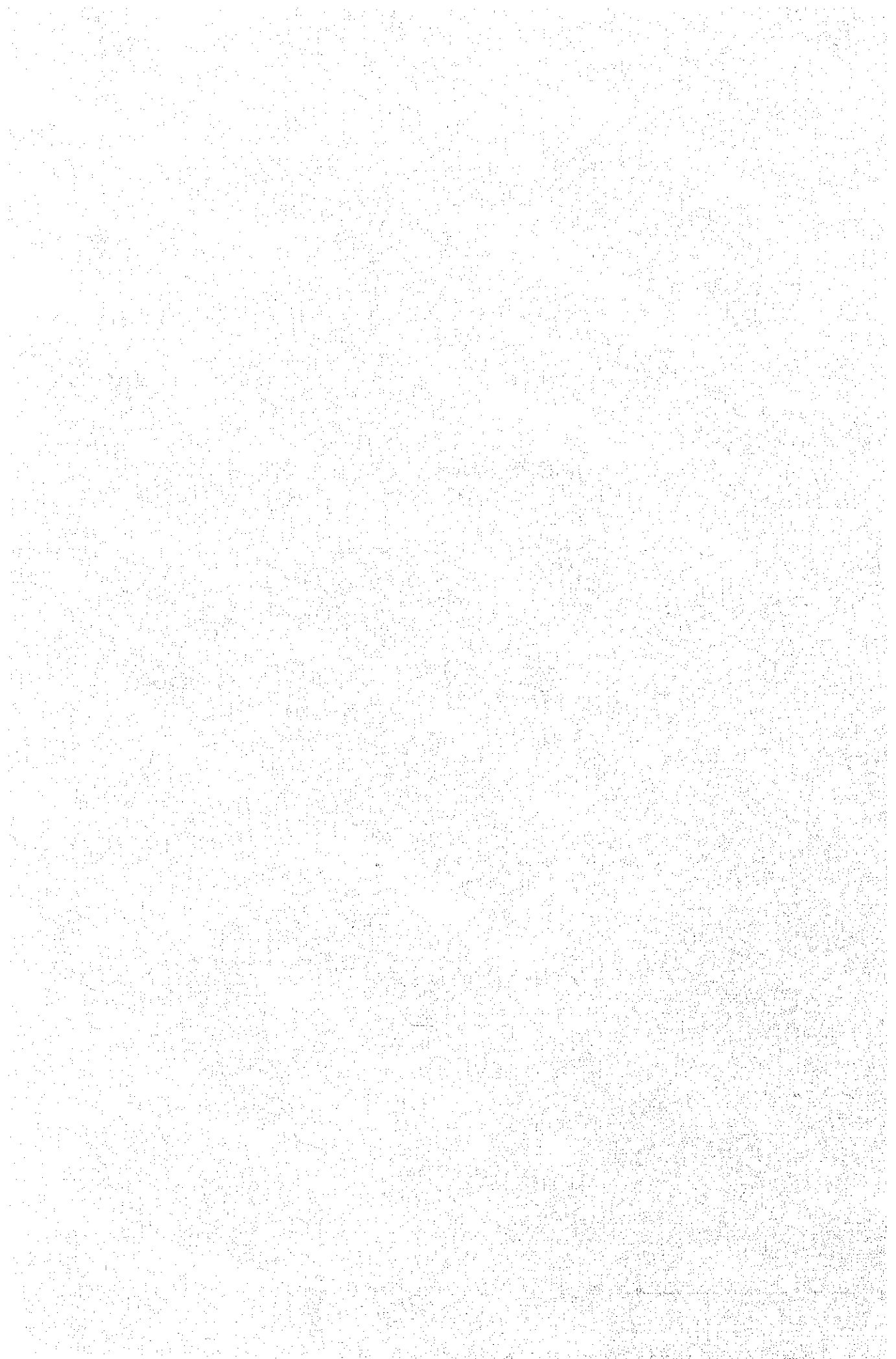
### LEGEND



OLTU RIVER HYDROELECTRIC  
POWER DEVELOPMENT PROJECT

Geological Investigation Work  
AYVALI AGGREGATE - PIT

## **A-4 Feasibility Design**



## A-4-1 Capacity of Spillway

### 1. General

Number and dimensions of spillway gate are determined so as to be able to divert the design flood discharge (P.M.F.; 4,750 m<sup>3</sup>/s for Olur, 5,270 m<sup>3</sup>/s for Ayvali) at H.W.L. (1,105 m for Olur, 930 m for Ayvali) with all three gates open. Further, water level rise are calculated at P.M.F. with one of the gates out of order.

### 2. Basic Formulas

$$Q = C \cdot L \cdot H_e^{3/2}$$

$$L = L' - 2 \cdot (n \cdot K_p - K_a) \cdot H_e$$

$$L' = n \cdot B$$

$$C/C_0 = 0.784 + 0.22 \cdot (H_e/H_0)^{0.77}$$

where, Q : discharge (m<sup>3</sup>/s)

H<sub>e</sub>: water depth from reservoir level to weir crest (m)

H<sub>0</sub>: water depth from design reservoir level to weir crest (m)

L : effective width of chute (m)

L' : total width of chute (m)

B : width of a chute (m)

n : number of gate

C<sub>0</sub>: coefficient of discharge at H<sub>0</sub>. (2.050 for Olur, 2.040 for Ayvali)

P : height of crest (m)

C : coefficient of discharge at H<sub>e</sub>

### 3. Design Condition

Main features of spillway gate

		Olur	Ayvali
Number (with full gates ordered) (with one of the gates out of order)	n =	3	3
		2	2
Dimensions	B =	13.50	13.50 m
	H <sub>0</sub> =	16.00	17.00 m
	P =	5.00	5.00 m
Design Discharge	Q =	4,750	5,270 m <sup>3</sup> /s

### 4. Calculations

Spillway capacity has been calculated at various reservoir level as shown in Table A-4-1. Consequently, it is obvious that the spillway has enough capacity for the design flood, and water level rise from H.W.L. for Olur and Ayvali are 3.00 m and 3.30 m respectively in case only two gates are under operation.

Table A-4-1

Reservoir W.L. (EL.)	Olur			Reservoir W.L. (EL.)	Ayvali		
	He (m)	Q (m <sup>3</sup> /s)			He (m)	Q (m <sup>3</sup> /s)	
		n = 3	n = 2			n = 3	n = 2
1,089.0	0.0	0	0	913.0	0.0	0	0
1,090.0	1.0	67	45	915.0	2.0	193	129
1,095.0	6.0	1,076	719	920.0	7.0	1,360	908
1,100.0	11.0	2,843	1,900	925.0	12.0	3,232	2,161
1,105.0	16.0	5,250	3,514	930.0	17.0	5,716	3,827
1,110.0	21.0	8,255	5,842	935.0	22.0	8,778	6,194



Fig.A-4-1 Spillway Capacity Curve, Olur

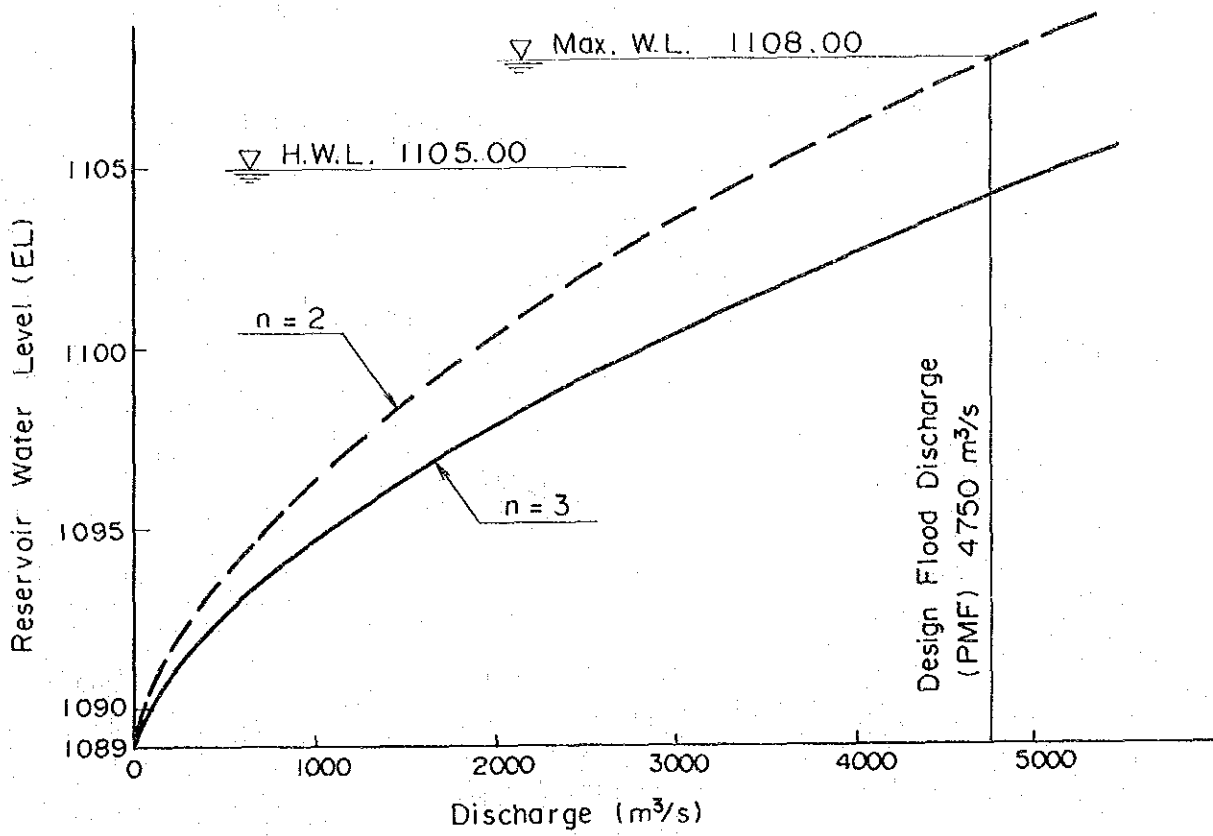
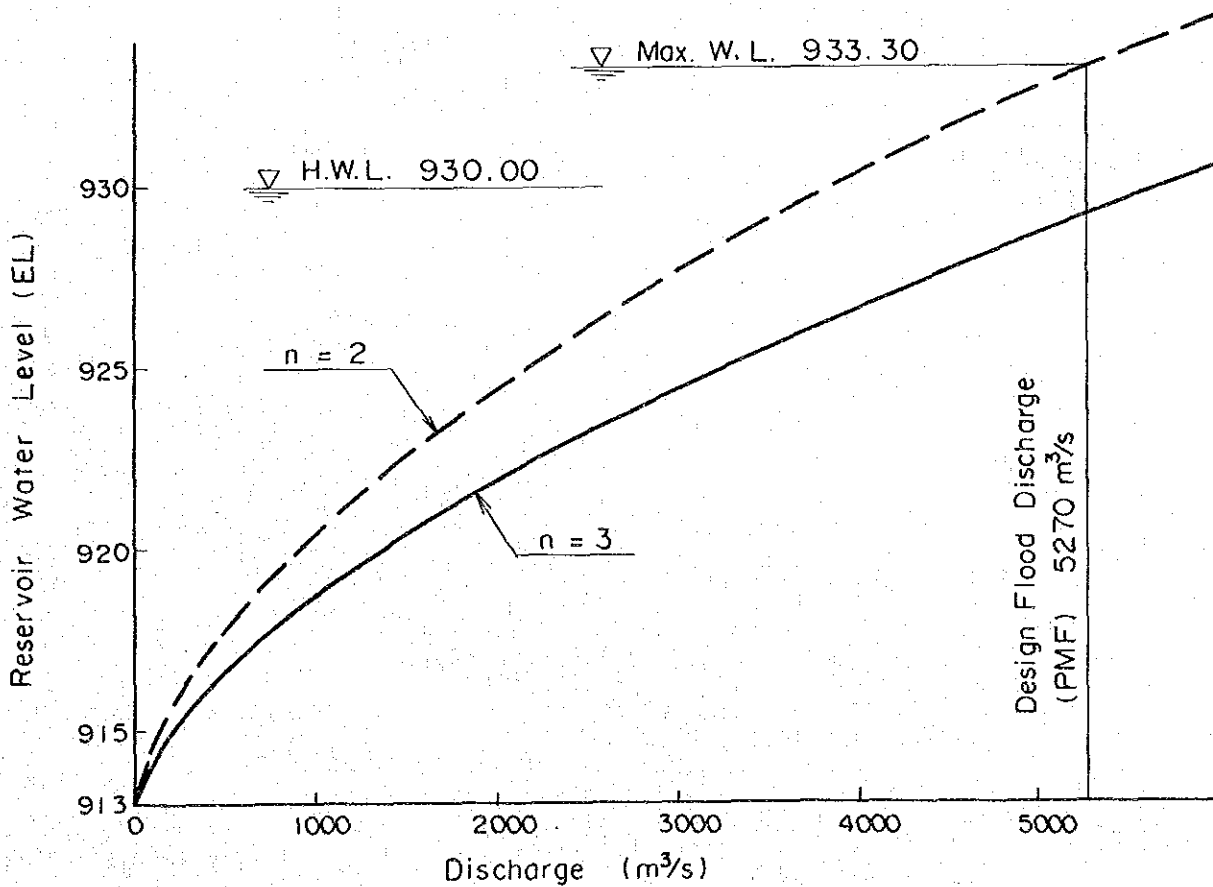


Fig.A-4-2 Spillway Capacity Curve, Ayvali



## A-4-2 Determination of Freeboard

### 1. General

The elevation of dam crest is determined enough high not to be lower than reservoir water level adding wave height and allowances.

### 2. Basic Formula

$$H_c \geq \max. ( H.W.L. + h_w + h_e + h_d + h_i, \max.W.L. + h_w )$$

where,  $H_c$  = elevation of dam crest (m)  
 $h_w$  = height of wave due to wind (m)  
 $h_e$  = height of wave due to earthquake (m)  
 $h_d$  = allowance considering delayed gate operation (m)  
 $h_i$  = additional amount according to type and importance of dam (m)  
 $\max.W.L.$  = water level in case only two gates are under operation (m)

### 3. Calculation

#### i) Height of Wave due to Wind

Although there are various formulae available regarding the relations of wind speed and fetch with wave height, the uprush height obtained by the combination of the S.M.B. method and Saville's method is used here.

Fetch	Olur 4,000 m	Ayvali 4,000 m
Average wind speed for 10 minutes	30 m/sec	30 m/sec
Height of Wave	1.20 m	1.20 m

#### ii) Height of Wave due to Earthquake

With regard to earthquake wave height the formula of Seiichi Sato which gives a comparatively large wave height is used.

$$h_e = k\tau / 2\pi * \sqrt{gH_o}$$

where,  $h_e$  = height of wave due to earthquake at the front of the dam (m)  
 $k$  = horizontal seismic coefficient (= 0.15)  
 $\tau$  = earthquake period (= 1 sec)  
 $H_o$  = reservoir water depth from normal water level  
 (= 85 m; Olur, 120 m; Ayvali)  
 $g$  = acceleration of gravity (= 9.8 m/sec<sup>2</sup>)

Height of Wave                      Olur; 0.69 m,              Ayvali; 0.82 m

#### iii) Extra Height According to Dam Type and Importance

Being a fill dam, 1.00 m is additionally considered for the sake of safety.

#### iv) Water Level in case only Two Gates are under Operation (Refer A-4-1,4-2 )

max. W. L.                              Olur; 1,108.00 m      Ayvali; 933.30 m

v) Calculation of Elevation of Dam Crest

$$\begin{aligned} \text{[Olur]} \quad \text{H.W.L.} + h_w + h_e + h_s + h_i &= 1,105.00 + 1.20 + 0.69 + 0.50 + 1.00 \\ &= 1,108.39 \text{ m} \end{aligned}$$

$$\begin{aligned} \text{max.W.L.} + h_w &= 1,108.00 + 1.20 \\ &= 1,109.20 \text{ m} \end{aligned}$$

$$\begin{aligned} H_c &\geq \max. ( \text{H.W.L.} + h_w + h_e + h_s + h_i, \text{max.W.L.} + h_w ) \\ &= 1,109.20 \text{ m} \longrightarrow 1,110.00 \text{ m} \end{aligned}$$

$$\begin{aligned} \text{[Ayvali]} \quad \text{H.W.L.} + h_w + h_e + h_s + h_i &= 930.00 + 1.20 + 0.82 + 0.50 + 1.00 \\ &= 933.52 \text{ m} \end{aligned}$$

$$\begin{aligned} \text{max.W.L.} + h_w &= 933.30 + 1.20 \\ &= 934.50 \text{ m} \end{aligned}$$

$$\begin{aligned} H_c &\geq \max. ( \text{H.W.L.} + h_w + h_e + h_s + h_i, \text{max.W.L.} + h_w ) \\ &= 934.50 \text{ m} \longrightarrow 935.00 \text{ m} \end{aligned}$$

therefore, elevation of dam crest for Olur and Ayvali were decided 1,110.00 m and 935.00 m respectively, i.e. 5.0 m of freeboard is to be taken for the dam.

Fig. A-4-3 Surging Curve in Olur Surge Tank  
 in case the Turbine is Suddenly stopped ( $Q = 48 \rightarrow 0 \text{ m}^3/\text{s}$ )

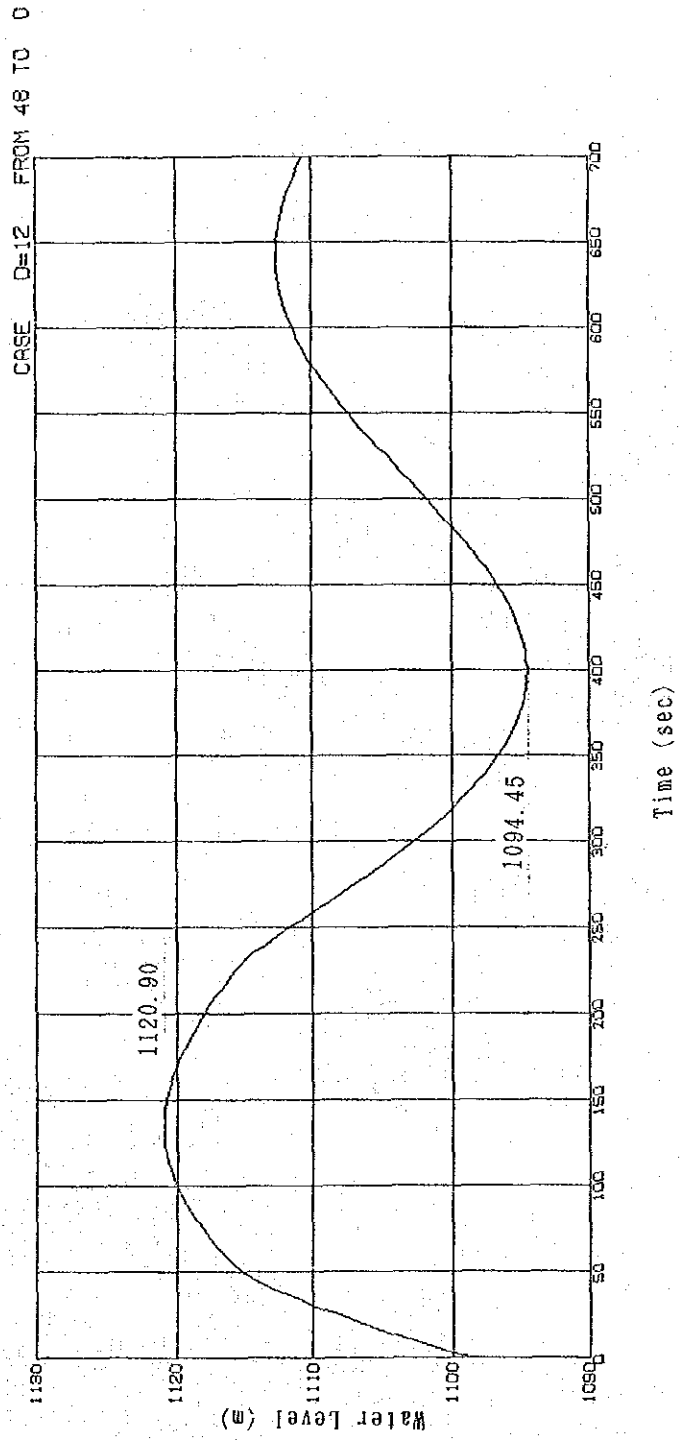


Fig. A-4-4 Surging Curve in Olur Surge Tank  
in case of Increase of Load ( $Q = 24 \rightarrow 48 \text{ m}^3/\text{s}$ )

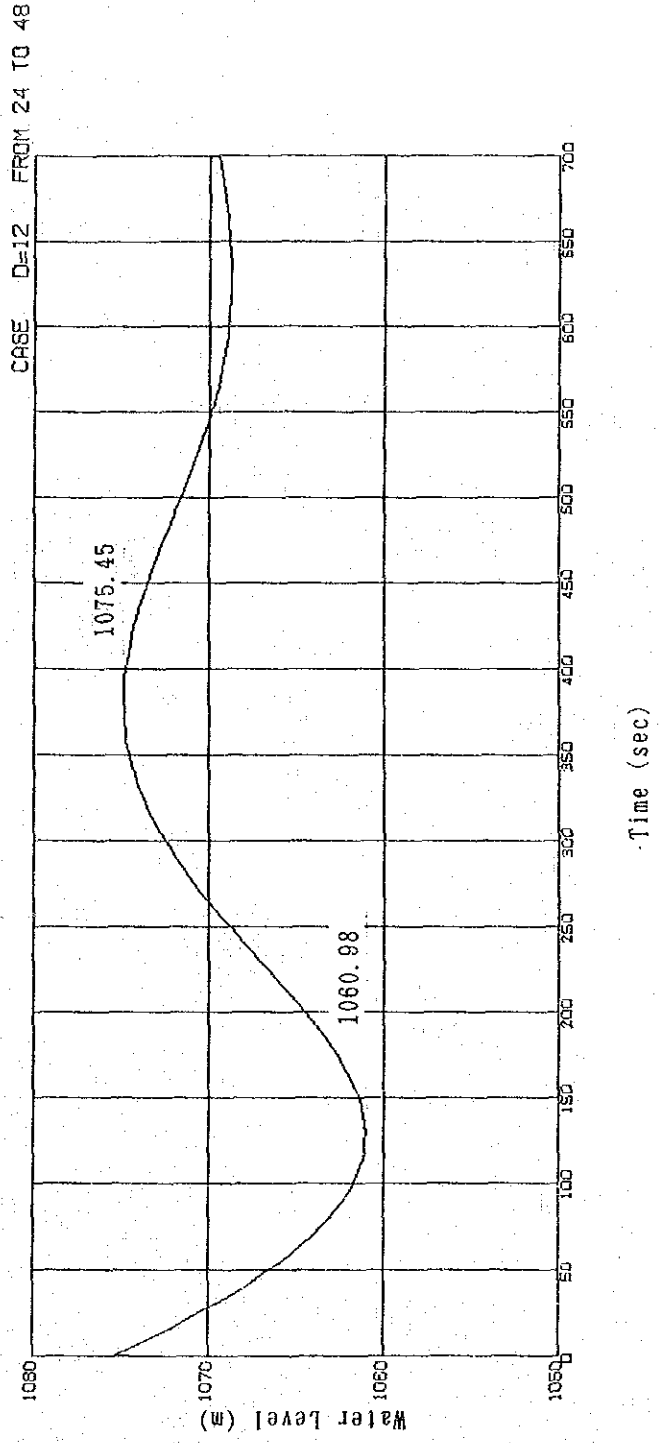


Fig. A-4-5 Surging Curve in Ayvalli Surge Chamber  
in case the Turbine is Suddenly stopped ( $Q = 67 \rightarrow 0 \text{ m}^3/\text{s}$ )

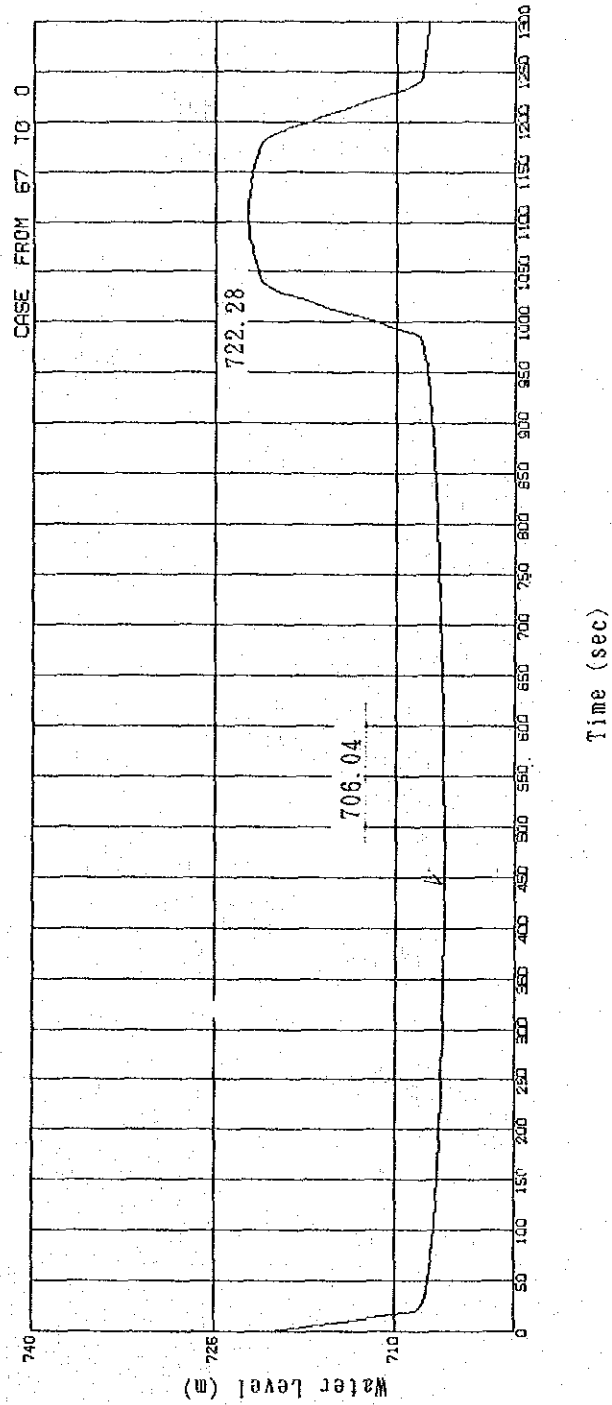


Fig. A-4-6 Surging Curve in Ayvali Surge Chamber  
in case of Increase of Load ( $Q = 33.5 \rightarrow 67 \text{ m}^3/\text{s}$ )

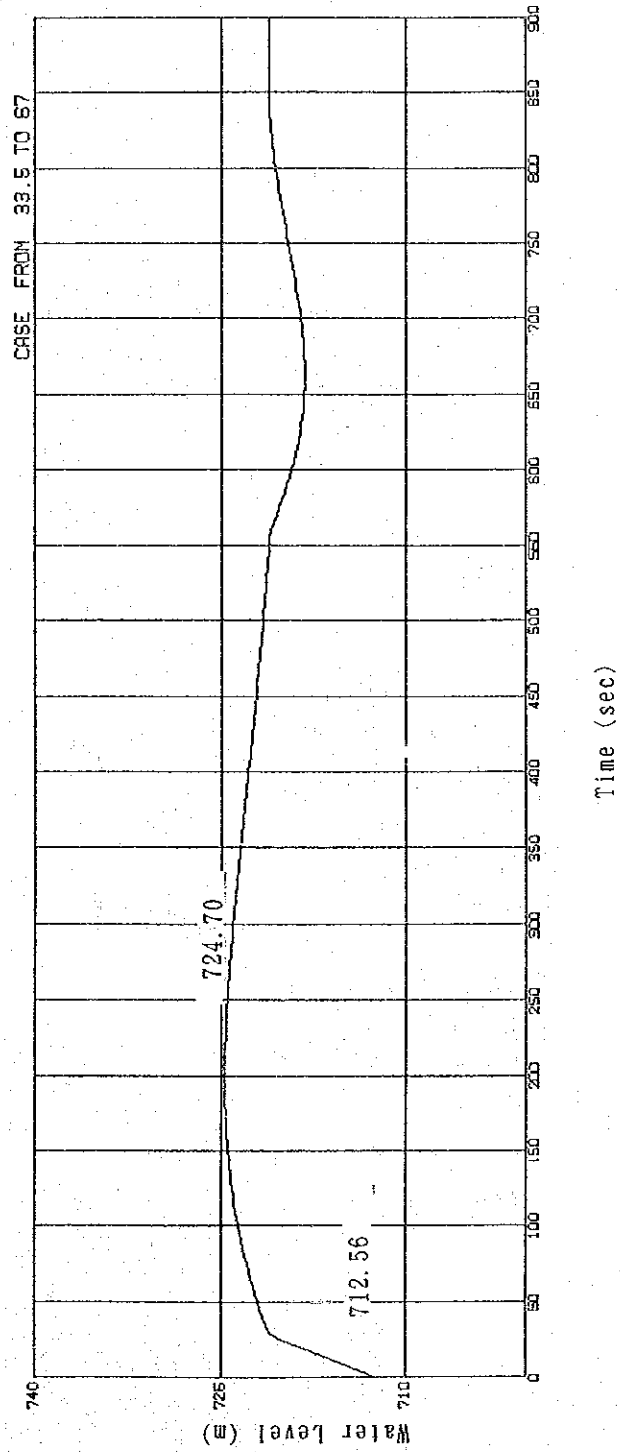
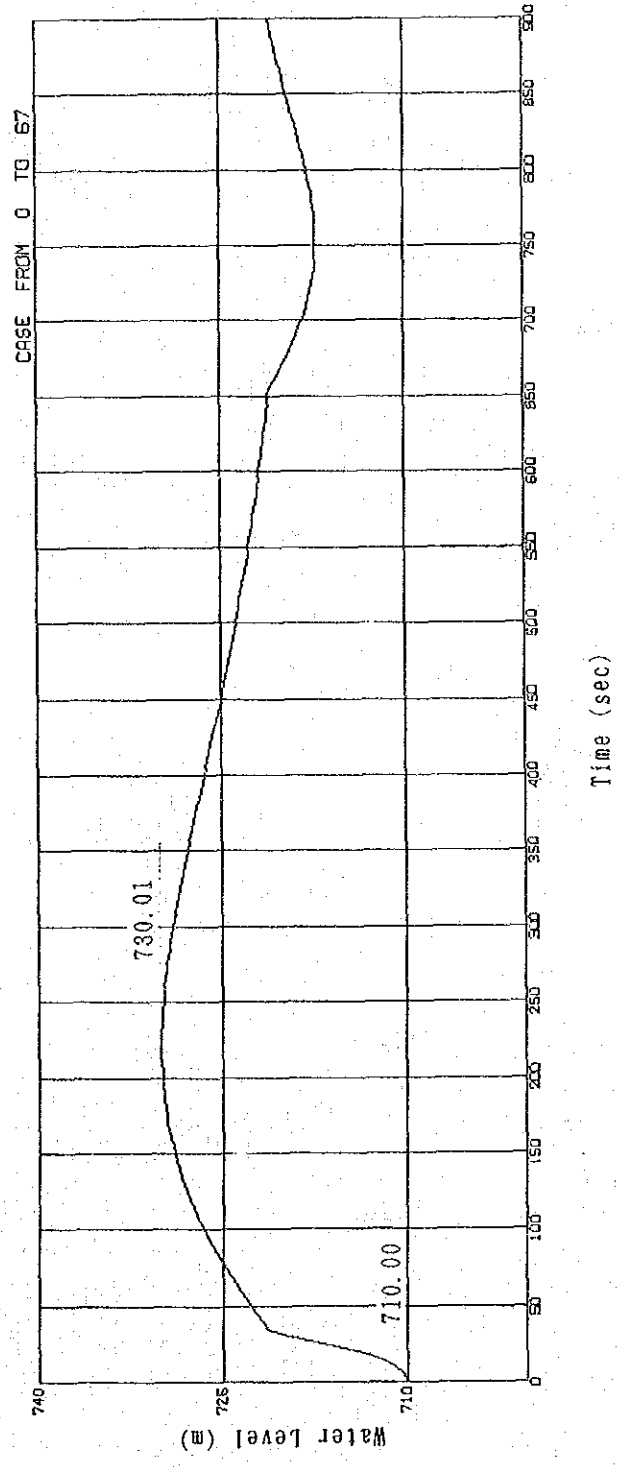


Fig. A-47 Surging Curve in Ayvali Surge Chamber  
in case of Rapid Increase of load ( $Q = 0 \rightarrow 67 \text{ m}^3/\text{s}$ )





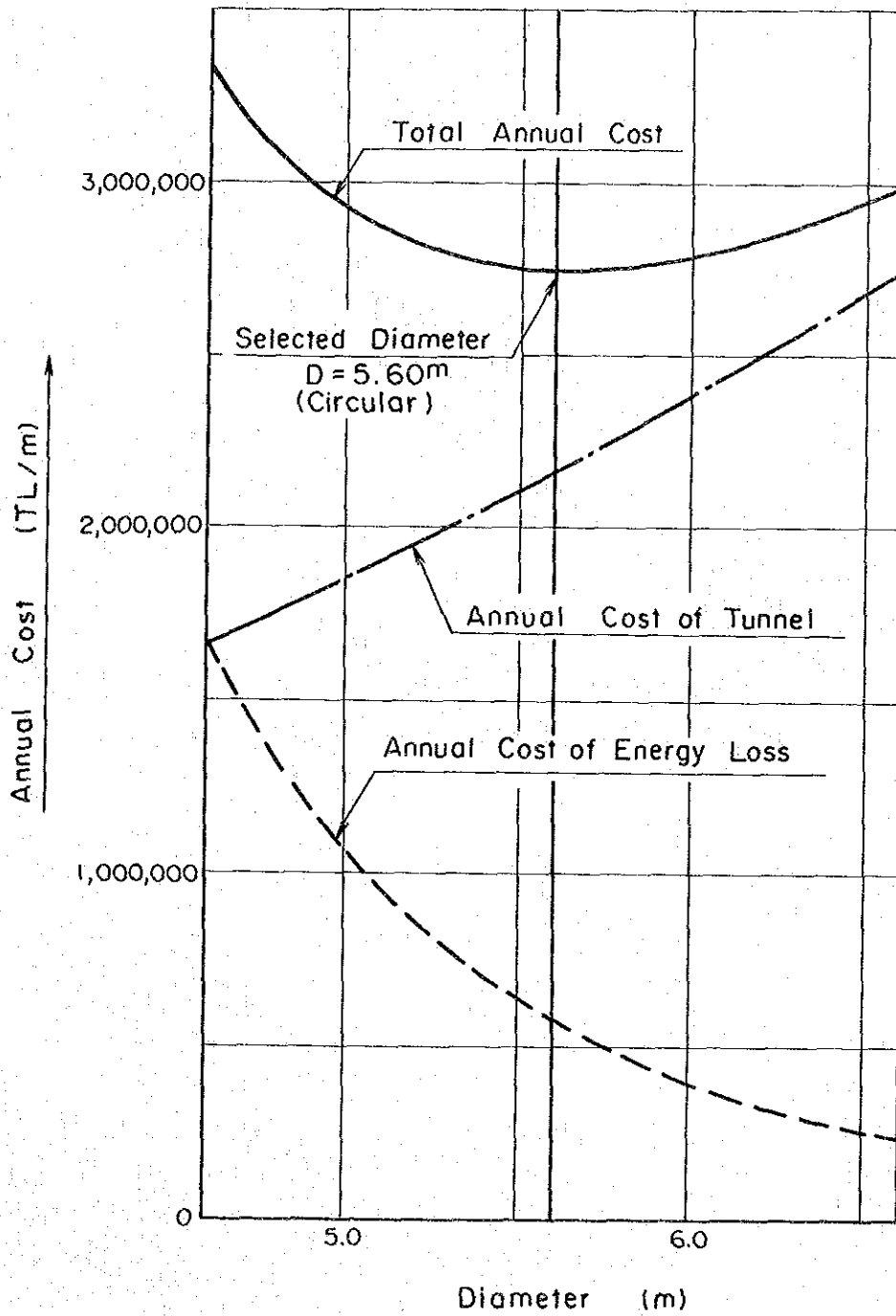


Fig. A-4-8 Estimation of Optimum Diameter of Headrace Tunnel, Ayvali (Alternative)